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Water-Supply and Irrigation Paper No. 201 Series P, Hydrographic Progress Reports, 55

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY OF NEW ENGLAND, 1906

(ATLANTIC COAST OF NEW ENGLAND DRAINAGE)

H. K. BARROWS
DISTRICT HYDROGRAPHER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

659146

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SURFACE WATER SUPPLY OF NEW ENGLAND, 1906.[a]

H. K. BARROWS,
District hydrographer.[b]

INTRODUCTION.

SCOPE OF WORK.

The water supply of the United States is of more importance to the life and pursuits of the people than any other natural resource. In the arid States the limit of agricultural development is determined by the amount of water available for irrigation, while in all parts of the country the increase in the population of cities and towns makes necessary additional water supplies for domestic and industrial uses, in procuring which both the quantity and the quality of the water that may be obtained must be considered. The location of manufacturing plants may depend largely on the water-power facilities and on the character of the water. The notable advances made in the electric transmission of power have led to the utilization of water powers for the operation of manufacturing establishments, railroads, and municipal lighting plants, many of which are at some distance from the places at which the power is developed.

The intelligent establishment and maintenance of enterprises or industries that depend on the use of water demands a thorough knowledge of the flow of the streams and an understanding of the conditions affecting that flow. This knowledge should be based on data showing both the total flow and the distribution of the flow throughout the year, in order that normal fluctuations may be provided for As the flow of a stream is variable from year to year, estimates of future flow can be made only from a study of observations covering several years. The rapid increase in the development of the water

[a] This report contains information similar to that published in previous years under title "Report on the Progress of Stream Measurements."

[b] The data were collected under the direction of H. K. Barrows, assisted by T. W. Norcross, A. D. Butterfield, G. M. Brett, R. A. Mention, and F. E. Pressey.

The data were prepared for publication under the direction of John C. Hoyt, assisted by R. H. Bolster, Robert Follansbee, J. E. Stewart, F. F. Henshaw, and H. D. Padgett.

resources of the United States has caused a great demand by engineers for information in regard to the flow of streams, as it is now generally realized that the failure of many large power, irrigation, and other projects has been due to the fact that the plans were made without sufficient trustworthy information in respect to the water supply.

Owing to the broad scope of these hydrographic investigations and the length of time they should cover in order that the records may be of greatest value, it is in general impossible for private individuals to collect the necessary data, and as many of the streams traverse more than one State this work does not properly fall within the province of the State authorities. The United States Geological Survey has, therefore, by means of specific appropriations by Congress, for several years systematically made records of stream flow, with the view of ultimately determining all the important features governing the flow of the principal streams of the country. In carrying out this plan stations are established on the streams and maintained for a period long enough to show their regimen or general behavior. When a record that is sufficient for this purpose has been obtained for any stream, the work on that stream is discontinued. The order in which the streams are measured is determined by the degree of their importance.

During 1906 the regimen of flow was studied at about 700 stations distributed along the various rivers throughout the United States, as shown on Pl. I. In addition to these records data in regard to precipitation, evaporation, water power, and river profiles were obtained in many sections of the country.

These data have been assembled by drainage areas and are published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 201 to 214, inclusive, each of which pertains to the surface water resources of a group of adjacent areas. In these papers are embodied not only the data collected in the field, but also the results of computations based on these data and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc. The list follows.

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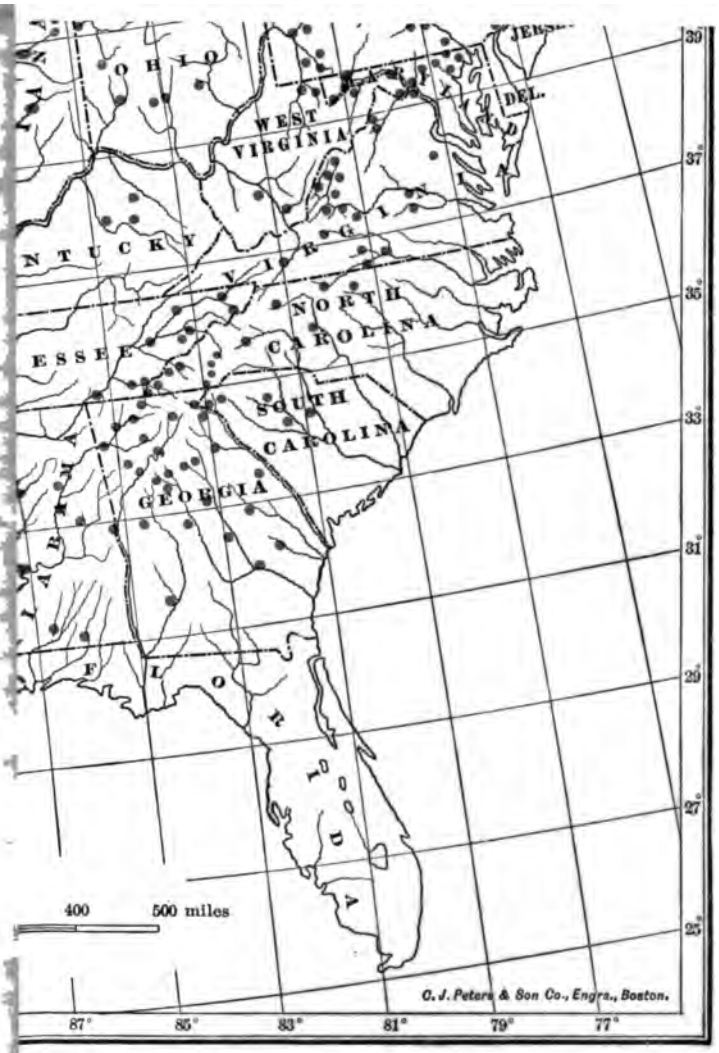
201. Surface water supply of New England, 1906. (Atlantic coast of New England drainage.)
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river drainages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.)
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages.)
205. Surface water supply of the Ohio and lower eastern Mississippi river drainages, 1906.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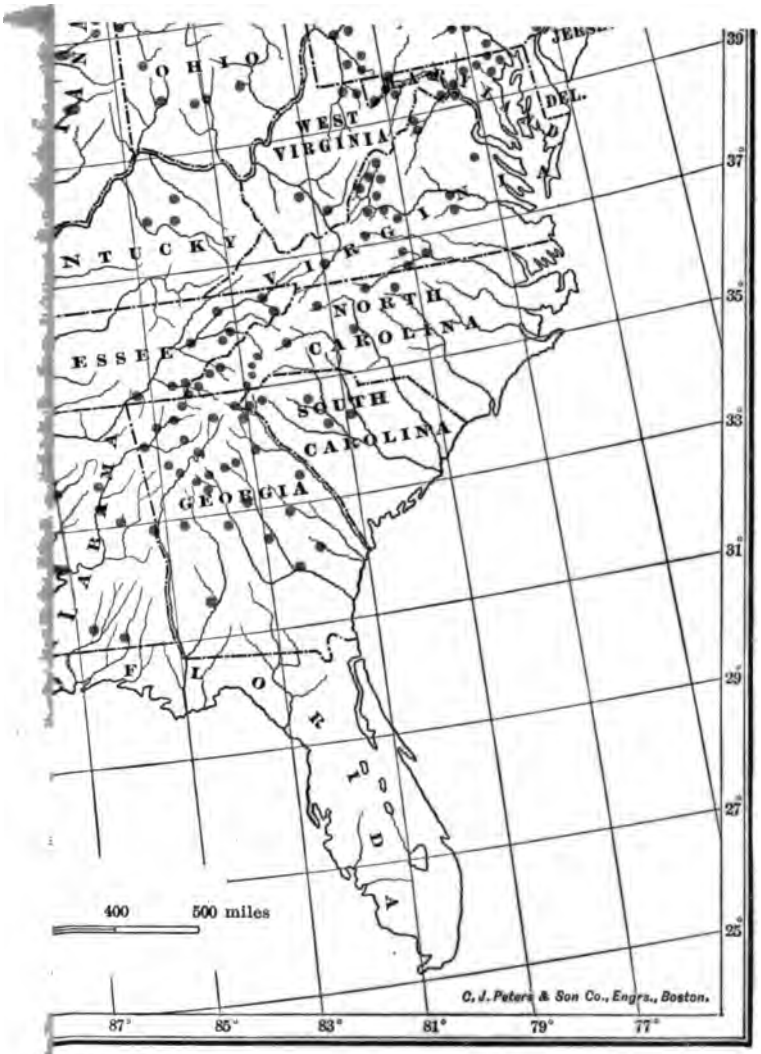
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206. Surface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
207. Surface water supply of the upper Mississippi River and Hudson Bay drainages, 1906.
208. Surface water supply of the Missouri River drainage, 1906.
209. Surface water supply of the lower western Mississippi River drainage, 1906.
210. Surface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
211. Surface water supply of the Colorado River drainage above Yuma, 1906.
212. Surface water supply of the Great Basin drainage, 1906.
213. Surface water supply of California, 1906. (The Great Basin and Pacific Ocean drainages in California and Colorado River drainage below Yuma.)
214. Surface water supply of the North Pacific Coast drainage, 1906.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing such records up to and including 1903 has been published in Water-Supply Paper No. 119. The following table gives, by years and primary drainage basins, the numbers of the papers on surface water supply published from 1901 to 1906:

Numbers of Water-Supply Papers containing results of stream measurements, 1901–1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
Atlantic coast of New England drainage	65 75	82	97	124	165	201
Hudson, Passaic, Raritan, and Delaware river drainages	65 75	82	97	125	166	202
Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages	65 75	82 83	97 98	126	167	203
Santee, Savannah, Ogeechee, and Altamaha rivers and eastern Gulf of Mexico drainages	65 75	83	98	127	168	204
Ohio and lower eastern Mississippi river drainages	65 75	83	98	128	169	205
Great Lakes and St. Lawrence River drainages	65	83	97	129	170	206
Hudson Bay and upper eastern and western Mississippi River drainages	65 66 75	83 84 85	98 99 100	128 130	171	207
Missouri River drainage	66 75	84	99	130 151	172	208
Meramec, Arkansas, Red, and lower western Mississippi river drainages	66 75	84	99	131	173	209
Western Gulf of Mexico and Rio Grande drainages	66 75	84	99	132	174	210
Colorado River drainage, above Yuma	66 75	85	100	133	175	211
The Great Basin drainage	66 75	85	100	33	176	212
The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage, below Yuma	66 75	85	100	34	177	213
North Pacific Coast drainage	66 75	85	100	135	178	214

[a] Reports containing data for years prior to 1901 are noted in the series list at the end of this paper.

DEFINITIONS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water,

as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot: One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.
6. Tables showing discharge and horsepower and the number of days during the year when the same are available.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station, and they also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of the

hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. At most stations the gage is read in the morning and in the evening.

The discharge measurements and gage heights are the base data from which the other tables are computed. In cases of extensive development it is expected that engineers will use these original data in making their calculations, as the computations made by the Survey are based on the data available at the time they are made and should be reviewed and, if necessary, revised when additional data are available.

The rating table gives the discharge in second-feet corresponding to various stages of the river as given by the gage heights. It is published to enable engineers to determine the daily discharge in case this information is desired.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest, and it is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. Upon this the computations for the remaining columns, which are defined on page 10, are based.

The values in the table of monthly discharge are intended to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

In most work where data in regard to flow are used the regimen of flow is of primary importance. Therefore for the principal stations tables have been prepared showing the horsepower that can be developed at various rates of flow, and the length of time that these rates of flow and the corresponding horsepower are available. These tables have been prepared on a basis of 80 per cent efficiency on the turbines, and the horsepower per foot of fall is given in order that the reader can determine the horsepower for any fall.

In the computations sufficient significant figures have been used so that the percentage of error in the tables will not in general exceed 1 per cent. Therefore, most of the values in the tables are given to only three significant figures. In making the various computations Thatcher's slide rule, Crelle's tables, and computation machines have been generally used.

In order to give engineers an idea of the relative value of the various data notes in regard to accuracy are given as far as possible. This accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data.

In the accuracy notes the following terms have been used, indicating the probable accuracy, in per cent, of the mean monthly flow. As these values are mean values, the error in the value for the flow of any individual day may be much larger.

Excellent indicates that the mean monthly flow is probably accurate to within 5 per cent; good, to within 10 per cent; fair, to within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equal 18.7 United States gallons per second.
100 California miner's inches equal 96.0 Colorado miner's inches.
100 California miner's inches for one day equal 4.96 acre-feet.
100 Colorado miner's inches equal 2.60 second-feet.
100 Colorado miner's inches equal 19.5 United States gallons per second.
100 Colorado miner's inches equal 104 California miner's inches.
100 Colorado miner's inches for one day equal 5.17 acre-feet.
100 United States gallons per minute equal 0.223 second-feet.
100 United States gallons per minute for one day equal 0.442 acre-foot.
1,000,000 United States gallons per day equal 1.55 second-feet.
1,000,000 United States gallons equal 3.07 acre-feet.
1,000,000 cubic feet equal 22.95 acre-feet.

1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equal about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel, realizing 80 per cent of theoretical power.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geol. Survey) and No. 95 (Accuracy of Stream Measurements). In order that those who use this report may readily become acquainted with the general methods employed, the following brief descriptions are given:

Streams may be divided, with respect to their physical conditions, into three classes: (1) Those with permanent beds; (2) those with beds which change only during extreme low or high water; and (3) those with constantly shifting beds. In determining the daily flow special methods are necessary for each class. The data on which the determinations are based and the methods of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir, (3) by measurements of the velocity of the current and of the area of the cross section. The method chosen for any case depends on the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v = c\sqrt{Rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The

results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir method.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable measurements of flow. The conditions necessary to insure good results may be divided into two classes: (1) Those relating to the physical characteristics of the dam itself, and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q=c\ b\ h^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Papers Nos. 180 and 200[a]); (*f*) either no flashboards or exceptional care in reducing leakage through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, the dam is built for purposes of power or navigation, and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such determinations of flow, the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured, either by a weir, a current meter, or a simple system of water wheels which are of standard make, or which have been rated as meters under working conditions and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the determinations of flow will not involve, for a critical stage of considerable duration, the use of a head on a broad-crested dam of less than 6 inches. Moreover, when all other conditions are good, the cooperation of the owners or operators of the plant is still essential if reliable results are to be obtained.

[a] Water-Supply Paper No. 200 replaces No. 150, the edition of which has been exhausted.

A gaging station at a weir or dam has the general advantage of continuity of record through the period of ice and floods and the disadvantages of uncertainty of coefficient to be used in the weir formula and of complications in the diversion and use of the water.

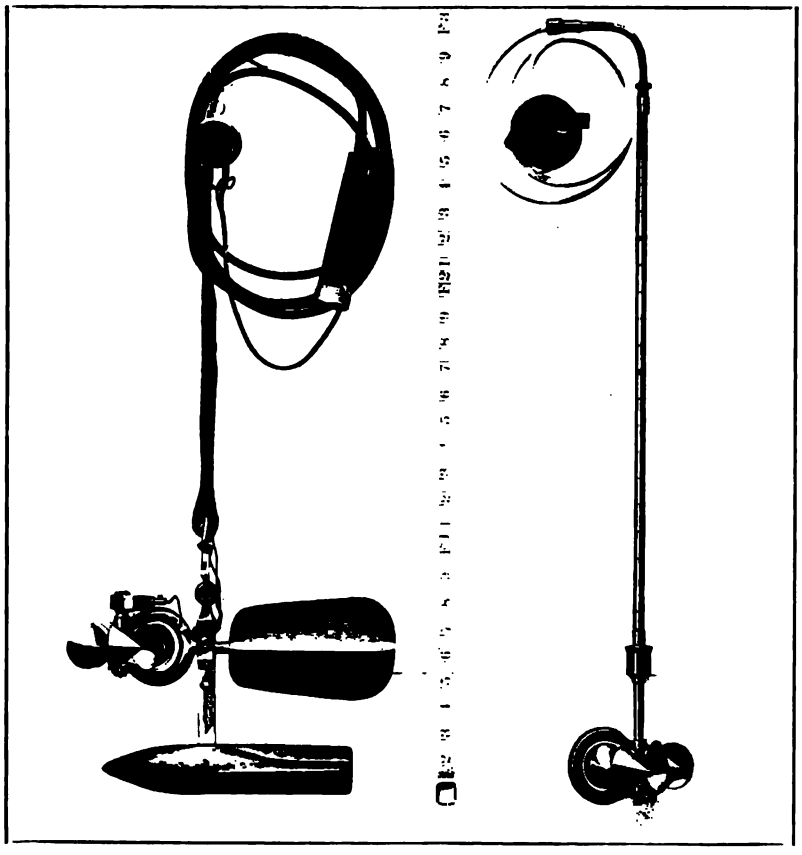
Velocity method.—The determination of the quantity of water flowing past a certain section of a stream at a given time is termed a discharge measurement. This quantity is the product of two factors—the mean velocity and the area of the cross section. The mean velocity is a function of surface slope, wetted perimeter, roughness of bed, and the channel conditions at, above, and below the gaging section. The area depends on the contour of the bed and the fluctuations of the water surface. The two principal ways of measuring the velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging stations for determining discharge by velocity measurements, in order that the data may have the required degree of accuracy. Their essential requirements are practically the same, whether the velocity is determined by meters or floats. They are located, as far as possible, where the channel is straight both above and below the gaging section; where there are no cross currents, backwater, or boils; where the bed of the stream is reasonably free from large projections of a permanent character, and where the banks are high and subject to overflow only at flood stages. The station must be so far removed from the effects of tributary streams and of dams or other artificial obstructions that the gage height shall be an index of the discharge.

Certain permanent or semipermanent structures, usually referred to as "equipment," are generally pertinent to a gaging station. These are a gage for determining the fluctuations of the water surface, bench marks to which the datum of the gage is referred, permanent marks on a bridge or a tagged line indicating the points of measurement, and, where the current is swift, some appliance (generally a secondary cable) to hold the meter in position in the water. As a rule the stations are located at bridges if the channel conditions are satisfactory, as from them the observations can more readily be made and the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In case of flood measurements good results can be obtained by observing the velocity of floating cakes of ice or débris. In case of all surface-float measurements coefficients must be used to reduce the observed velocity to the mean velocity. The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

A. CURRENT-METER RATING STATION AT LOS ANGELES, CAL.



B. PRICE CURRENT METERS.

in one part of the stream may not be extended to parts where they do not apply.

Three classes of methods of measuring velocity with current meters are in general use—multiple-point, single-point, and integration.

The three principal multiple-point methods in general use are the vertical velocity-curve; 0.2 and 0.8 depth; and top, bottom, and mid-depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually from 0.5 to 1 foot apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve among the resulting points, the vertical velocity-curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the area bounded by this velocity-curve and its axis by the depth. On account of the length of time required to

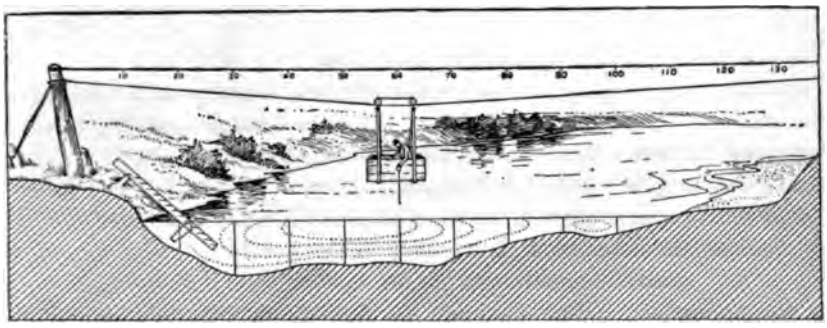


FIG. 1.—Cable station, showing section of river, car, gage, etc.

make a complete measurement by this method, its use is limited to the determination of coefficients for purposes of comparison and to measurements under ice.

In the second multiple-point method the meter is held successively at 0.2 and 0.8 of the depth, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. On the assumption that the vertical velocity-curve is a common parabola with horizontal axis, the mean of the velocities at 0.22 and 0.79 of the depth will give (closely) the mean velocity in the vertical. Actual observations under a wide range of conditions show that this second multiple-point method gives the mean velocity very closely for open-water conditions, and moreover the indications are that it holds nearly as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid-depth, at 0.5 foot below the surface, and at 0.5 foot above the bottom, and the mean velocity is determined by dividing by 6 the sum of the top

velocity, four times the mid-depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity, or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity-curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in a majority of the measurements. A large number of vertical velocity-curve measurements, taken on many streams and under varying conditions, show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of the wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is specially adapted for flood measurements, or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical-integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface, and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river, which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at various points of measurement, the measuring section is divided into elementary strips, as shown in fig. 1, and the velocity, area, and discharge are determined separately for either

a single or a double strip. The total discharge and the area are the sums of those for the various strips, and the mean velocity is obtained by dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, owing to diversity and instability of conditions during the winter period and also to lack of definite information in regard to the laws of flow of water under ice. The method now employed is to make frequent discharge measurements during the frozen periods by the 0.2 and 0.8, and vertical velocity-curve methods, and to keep an accurate record of the conditions, such as the gage height to the surface of the water as it rises in a hole cut in the ice, the thickness and character of the ice, etc.

From these data an approximate estimate of the daily flow can be made by constructing a rating curve (really a series of curves) similar to that used for open channels, but considering, in addition to gage heights and discharge, the varying thickness of ice. For information in regard to flow under ice cover see Water-Supply Paper No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of determining run-off, depending on whether or not the bed of the stream is permanent.

For stations on streams with permanent beds the first step in computing the run-off is the construction of a rating table, which shows the discharge corresponding to any stage of the stream. This rating table is applied to the record of stage to determine the amount of water flowing. The construction of the rating table depends on the method used in measuring flow.

For a station at a weir or dam the basis for the rating table is some standard weir formula. The coefficients to be used in its application depend on the type of dam and other conditions near its crest. After inserting in the weir formula the measured length of crest and the assumed coefficient the discharge is computed for various heads and the rating table constructed.

The data necessary for the construction of a rating table for a velocity-area station are the results of the discharge measurements, which include the record of stage of the river at the time of measurement, the area of the cross section, the mean velocity of the current, and the quantity of water flowing. A thorough knowledge of the conditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends on the following laws of flow for open, permanent channels: (1) The discharge will remain constant so long as conditions at or near the gaging station remain constant; (2) the discharge will be the same whenever the stream is at a given stage if the change of slope due to the rise and fall of the stream be neglected; (3) the discharge is a function of and increases gradually with the stage.

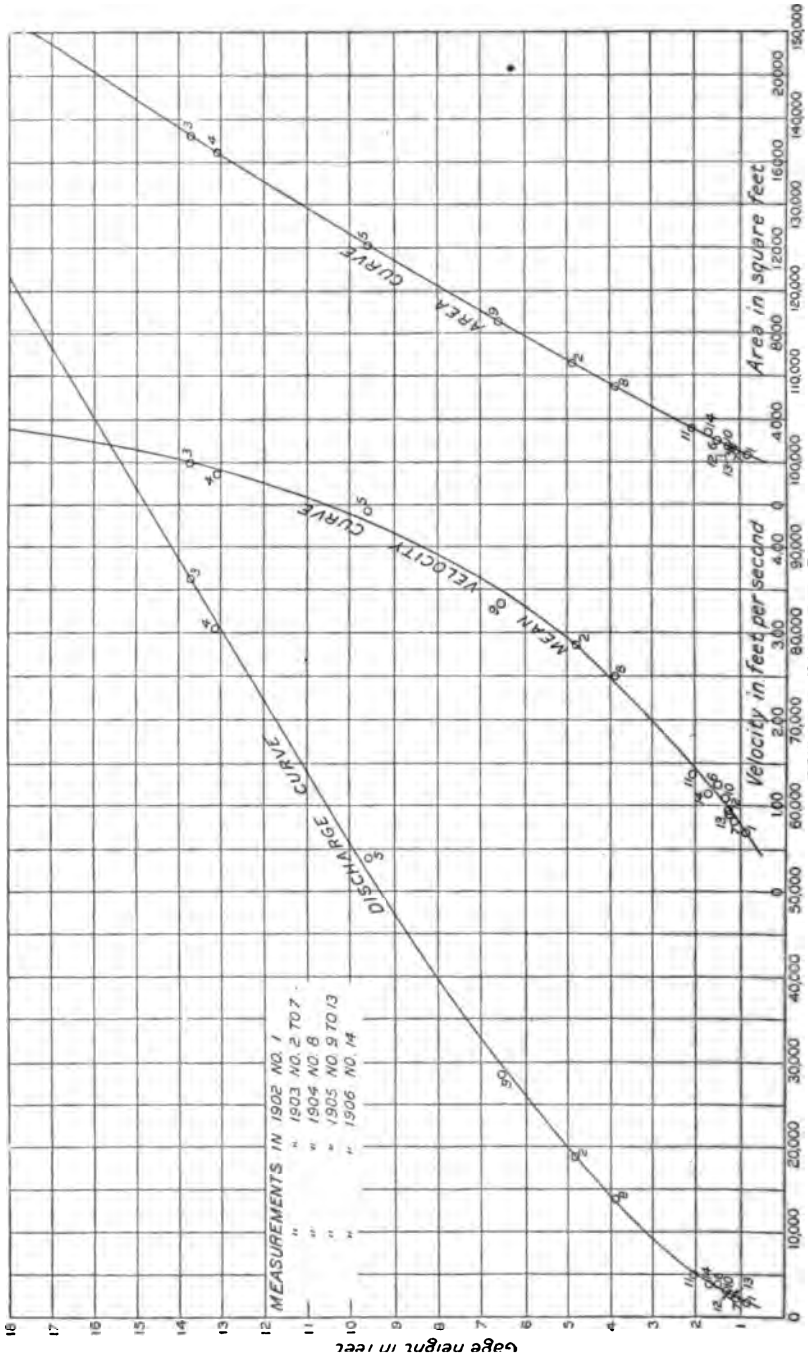


FIG. 2.—Discharge, area, and mean-velocity curves for Potomac River at Point of Rocks, Md.

The plotting of results of the various discharge measurements, using gage heights as ordinates, and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. For the development of these curves there should be, therefore, a sufficient number of discharge measurements to cover the range of the stage of the stream. Fig. 2 shows a typical rating curve with its corresponding mean-velocity and area curves.

As the discharge is the product of two factors, the area and the mean velocity, any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is always concave toward the horizontal axis or on a straight line, unless the banks of the stream are overhanging.

The form of the mean-velocity curve depends chiefly on the surface slope, the roughness of the bed, and the cross section of the stream. Of these, the slope is the principal factor. In accordance with the relative changes of these factors the curve may be either a straight line, convex or concave toward either axis, or a combination of the three. From a careful study of the conditions at any gaging station the form which the vertical velocity-curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the determinations of flow are to be other than rough approximations. For stations with beds which shift slowly or are materially changed only during floods

rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days and the discharges for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report of the United States Geological Survey, Part IV, page 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in determining the flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Assistance has been rendered or records furnished by the following, to whom special acknowledgment is due:

Maine State survey commission, L. A. Lee, chairman, C. S. Hichborn, secretary and treasurer, and William Engel; Bangor and Aroostook Railroad; Maine Central Railroad; Washington County Railroad; Portland and Rumford Falls Railroad; Montpelier and Wells River Railroad; H. S. Ferguson, engineer of Great Northern Paper Company; H. C. Lord; F. E. Boston, agent, and James L. Dean, engineer, for the Hollingsworth & Whitney Company; Joseph A. Warren, of S. D. Warren & Co.; C. A. Mixer, engineer for the Rumford Falls Power Company; Walter H. Sawyer, agent Union Water Power Company, Lewiston, Me.; J. Brodie Smith, manager of Manchester Traction Light and Power Company; R. A. Hale, principal assistant engineer Essex Company, Lawrence, Mass.; Frederic P. Stearns, chief engineer of the Metropolitan water and sewerage board; Otis Company and George H. Gilbert Manufacturing Company, Ware, Mass.; John T. F. MacDonnell, Holyoke, Mass.; E. E. Lochridge, engineer for the Springfield water department.

ATLANTIC COAST OF NEW ENGLAND DRAINAGE.

ST. JOHN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

St. John River drains the largest basin between St. Lawrence River on the north and Susquehanna River on the south. Its total drainage area is stated by Wells[a] to be 26,000 square miles, of which approximately 7,500 square miles lie in Maine, its basin occupying the whole northern portion of the State. The extreme headwaters lie in the mountainous region between Maine and Canada, at elevations of 1,500 and 2,000 feet; thence its waters flow at first generally north-

[a] Wells, Walter, The water power of Maine, 1869.

eastward through Maine. From the point of junction of the northwest and southwest branches, where the river first takes its name, to its junction with St. Francis River, a distance of 90 miles, its course lies wholly in Maine, though a portion of the tributary area lies in Canada. In this distance Allegash River is the only tributary of importance. Wells estimates the average slope in the 90 miles to be 1.6 feet per mile. From its junction with St. Francis River the St. John forms the northern boundary of Maine for 70 miles. Within this distance the slope is slightly greater than above, having been estimated at 2.7 feet per mile, while the volume is considerably augmented by two important tributaries—Fish River from the south and Madawaska River from the north. At the point where it leaves the State line the river has an elevation of about 420 feet above sea level and drains an area of 8,765 square miles, of which 4,670 square miles are in Maine and 4,095 square miles in Canada. Beyond this point it receives the waters of Aroostook and Meduxnekeag rivers, the basins of which are almost entirely in Maine, besides several smaller tributaries having their sources, and in some cases a large portion of their drainage basins in the same State.

Both the Allegash and upper St. John rivers are generally inaccessible. The middle St. John, forming the northern boundary of the State, may be reached on the Canadian side at any point by the Temiscouata Railway, and on the Maine side at Fort Kent and Van Buren by the Bangor and Aroostook Railroad. The basins of Fish and Aroostook rivers are easily accessible by the latter road. The drainage areas of the principal tributaries are given in Water-Supply Paper No. 165, page 20.

ST. JOHN RIVER AT FORT KENT, ME.

This station was established October 13, 1905. It is located at the footbridge which crosses the St. John near Fort Kent post-office, a short distance above the point where Fish River enters the St. John. The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 21.

Discharge measurements of St. John River at Fort Kent, Me., 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
October 13 [a]	F. E. Pressey	230	385	2.55	660
1906.					
May 29	F. E. Pressey	656	3,910	8.25	17,400
August 15	do	431	735	3.20	1,420

[a] Measured partly from a boat and partly by wading.

Daily gage height, in feet, of St. John River at Fort Kent, Me., for 1905–6.

Day.	1905.		1906.						
	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.
1		3.35		9.95	6.45	4.8	2.9		3.6
2		3.9		10.6	6.45	4.8	2.9		3.5
3		4.1		10.95	6.15	4.75	2.8		3.5
4		4.55		11.55	5.9	4.7	2.8		3.5
5		5.15		11.85	5.75	4.7	2.8		3.5
6		4.9		12.6	5.55	4.6	2.8		3.5
7		4.9		12.9	5.45	4.6	2.8		3.5
8				13.25	5.0	4.6	2.8		3.5
9				13.3	5.0	4.5	2.8		3.5
10				12.9	5.0	4.5	2.95		3.5
11				12.35	5.0	4.4	3.15		3.5
12				11.8	4.9	4.3	3.25		3.5
13	2.6			11.3	4.9	4.2	3.3		3.5
14	2.7			10.6	4.8	4.2	3.15		3.5
15	2.6			9.9	4.8	4.1	2.95		3.5
16	2.65			9.3	4.7	4.0	2.8		3.5
17	2.6			9.1	4.7	4.0			3.35
18	2.6			9.0	4.7	4.0			3.45
19	2.6			9.0	4.6	4.0			3.5
20	2.45			8.9	4.5	3.9			3.65
21	2.8		*8.9	8.85	4.45	3.8		3.2	3.85
22	3.35		8.8	8.45	4.5	3.7		3.65	4.4
23	4.35		8.75	7.9	4.5	3.6		3.95	4.3
24	4.0		9.05	7.45	4.75	3.5		4.3	4.3
25	3.8		9.4	6.95	5.3	3.4		4.5	4.3
26	3.65		9.9	6.85	6.15	3.3		4.25	
27	3.4		10.35	6.7	6.85	3.2		3.95	
28	3.05		10.65	6.6	7.3	3.2		3.55	
29	3.1		10.4	6.5	7.95	3.1		3.55	
30	2.95		10.1	6.5	7.95	3.0		3.4	
31	2.8			6.5		3.0		3.55	

NOTE.—From August 16 to October 20, 1906, inclusive, gage readings were reported at 2.8 feet, but during much of the time were probably below this, as gage could not be read.

Rating table for St. John River at Fort Kent, Me., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.40	550	3.90	2,680	5.40	6,620	7.80	15,430
2.50	630	4.00	2,890	5.50	6,930	8.00	16,250
2.60	710	4.10	3,110	5.60	7,250	8.20	17,090
2.70	800	4.20	3,340	5.70	7,580	8.40	17,930
2.80	900	4.30	3,580	5.80	7,910	8.60	18,780
2.90	1,010	4.40	3,830	5.90	8,250	8.80	19,640
3.00	1,130	4.50	4,090	6.00	8,590	9.00	20,500
3.10	1,270	4.60	4,350	6.20	9,280	10.00	24,950
3.20	1,420	4.70	4,610	6.40	10,000	11.00	29,550
3.30	1,580	4.80	4,880	6.60	10,730	12.00	34,250
3.40	1,740	4.90	5,150	6.80	11,470	13.00	39,050
3.50	1,910	5.00	5,430	7.00	12,220	13.3	40,520
3.60	2,090	5.10	5,720	7.20	13,000		
3.70	2,280	5.20	6,010	7.40	13,800		
3.80	2,480	5.30	6,310	7.60	14,610		

NOTE.—The above table is applicable only for open-channel conditions. It is based on three discharge measurements made during 1905–6. This curve should be fairly accurate, but is subject to revision later when more data become available.

Monthly discharge of St. John River at Fort Kent, Me., for 1905–6.

[Drainage area, 5,280 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
October (13-31)	3,700	590	1,350	0.256	0.18
November (1-7)	5,860	1,660	3,980	.754	.20
1906.					
April (21-30)	27,900	19,400	23,300	4.41	1.64
May	40,500	10,400	24,000	4.55	5.25
June	16,000	3,960	7,090	1.34	1.50
July	4,880	1,130	3,060	.580	.67
August (1-16)	1,580	900	1,070	.203	.12
October (21-31)	4,090	1,420	2,550	.483	.20
November (1-25)	3,830	1,660	2,220	.421	.39

NOTE.—The above values are only approximate, owing to errors in gage-height observations.

FISH RIVER AT WALLAGRASS, ME.

This station was established July 29, 1903. It is located at Wallagrass, Me., just below the outlet of Wallagrass Brook. The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 21, where are given also references to publications that contain data for previous years.

Discharge measurements of Fish River at Wallagrass, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.[a]	Gage height.[b]	Thickness of ice.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Feet.*	*Feet.*	*Sec.-ft.*
February 15	F. E. Pressey	95	205	3.91	3.91	1.25	196
March 15	do	115	312	4.99	5.03	1.20	378
March 15	do	115	319	5.08	5.12	1.20	390
May 30	do	168	1,210	9.30			4,250
August 15	do	106	240	2.50			175

[a] To water surface. [b] To top of ice.

Daily gage height, in feet, of Fish River at Wallagrass, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					8.8		5.8	3.1	2.2	1.9		4.2
2			4.3		9.3	8.6					4.8	
3						8.2	5.3	3.0	2.1	1.9	4.7	4.5
4					10.2			3.0		1.8		
5				3.2	11.2	7.6	5.0		2.1		4.7	4.5
6	2.9							2.9	2.1	1.8		
7				3.2	12.0	7.3	4.9	2.9			4.5	4.5
8			4.3	3.2	13.0				2.1	1.8		4.4
9		3.5				7.0	4.7	2.8	2.1	1.8	4.9	
10				3.2	13.6	7.0					5.0	5.2
11	3.1						4.5	2.8	2.1	3.0		
12				3.2	13.7	7.0					4.8	4.9
13							4.4	2.7	2.1	2.9		
14		3.9	5.1	3.3	13.5	7.0	4.3				4.6	4.8
15				3.5			4.2	2.5	2.1	2.0		4.8
16					13.2	6.3		2.5	2.0	3.2	4.5	
17				3.7	13.2		4.0			3.5	4.4	4.5
18						6.0		2.4	2.0			
19				4.2	13.0		3.9			3.7	4.4	
20	3.0	3.8		4.7		6.6		2.4	2.0	3.7		

Daily gage height, in feet, of Fish River at Wallagrass, Me., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21				5.3	12.7		3.8	2.4			4.3	
22					12.3	4.7			1.9	3.8		
23			5.2	5.5		4.6	3.7	2.4			4.2	4.6
24	3.3				11.0		3.7		1.9	3.9	4.1	
25				6.0		6.0		2.4				
26				6.8	10.8	6.0	3.6	2.3	2.0	4.7	4.4	4.8
27				7.2	10.5					4.5		
28			4.6	7.5		6.0	3.3	2.3	2.0		4.4	
29					9.4				2.0	4.5		
30	3.4			8.4		5.9	3.2	2.2			4.3	
31					8.8					4.7		

NOTE.—The following ice conditions prevailed during 1906: River frozen from January 1 to about April 20; ice began to wear away about March 25; there was no ice near gage or measuring section after April 5. There was ice along both shores during December, but river did not freeze entirely across. During the frozen period gage heights were taken to water surface, through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 6 [a]	2.9	3.0	0.1	March 2	4.3	4.3	1.15
January 11 [a]	3.1	3.0	.7	March 8	4.3	4.2	.85
January 20 [a]	3.0	3.1	.8	March 14	5.1	5.2	1.25
January 24 [a]	3.3	3.4	.1	March 23	5.2	5.2	1.3
January 30	3.4	3.4	.65	March 28 [a]	4.6	4.6	.1
February 9	3.5	3.6	.9	December 17 [a]	4.5	5.0	.8
February 14	3.9	3.9	1.25	December 23 [a]	4.6	4.7	.7
February 20	3.8	3.9	1.35	December 26 [a]	4.8	4.9	1.3

[a] Open channel in midstream; thickness of ice given is at gage, near shore.

Rating table for Fish River at Wallagrass, Me.

OPEN-CHANNEL CONDITIONS, 1903 TO 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.80	59	3.20	366	4.60	888	7.00	2,200
1.90	72	3.30	397	4.70	932	7.20	2,331
2.00	86	3.40	429	4.80	977	7.40	2,464
2.10	102	3.50	462	4.90	1,023	7.60	2,599
2.20	120	3.60	496	5.00	1,070	7.80	2,738
2.30	139	3.70	531	5.20	1,167	8.00	2,880
2.40	159	3.80	567	5.40	1,268	9.00	3,650
2.50	180	3.90	604	5.60	1,372	10.00	4,520
2.60	203	4.00	642	5.80	1,479	11.00	5,490
2.70	227	4.10	681	6.00	1,590	12.00	6,550
2.80	252	4.20	721	6.20	1,705	13.00	7,650
2.90	279	4.30	762	6.40	1,824	14.00	8,850
3.00	307	4.40	803	6.60	1,946		
3.10	336	4.50	845	6.80	2,071		

[a] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906, and is well defined.

FROZEN SEASON, 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.30	140	2.90	230	3.50	320	4.10	425
2.50	170	3.10	260	3.70	355	4.30	460
2.70	200	3.30	290	3.90	390	4.50	495

[a] This table is applicable only for ice-covered conditions using gage heights to bottom of ice. It is based on 4 discharge measurements made during 1906, and is fairly well defined between gage heights 2.5 feet and 4 feet.

Monthly discharge of Fish River at Wallagrass, Me., for 1906.

[Drainage area, 890 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
nuary			193	0.217	0.25
bruary			202	.227	.24
rch			380	.427	.49
ril	3,170	305	953	1.07	1.19
y	8,490	3.490	6,330	7.11	8.20
ne	3,410	888	2,010	2.26	2.52
ly	1,480	351	753	.846	.98
gust	336	120	206	.231	.27
otember	120	72	92.8	.104	.12
tober	932	59	419	.471	.54
vember	1,070	681	860	.966	1.08
cember			561	.630	.73
The year			1,080	1.21	16.61

NOTE.—Values are rated as follows: January to March and December, fair; September, good; nainder of year excellent.

AROOSTOOK RIVER AT FORT FAIRFIELD, ME.

This station was established July 31, 1903. It is located at the eel highway bridge in the village of Fort Fairfield. The conditions id the bench marks are described in Water-Supply Paper No. 165, ıge 24, where are given also references to publications that contain ıta for previous years.

A measurement was made August 17, 1906, by F. E. Pressey, ith the following results:

Width, 269 feet; area, 515 square feet; gage height, 3.44 feet; discharge, 488 second-et.

Daily gage height, in feet, of Aroostook River at Fort Fairfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	3.6				11.9	6.75	4.95	4.35	3.25	3.3	4.6	4.4
					12.3	6.6	4.7	4.05	3.2	3.35	4.6	4.4
					12.65	6.8	4.55	3.85	3.2	3.4	4.5	4.4
				5.4	12.15	7.4	4.2	3.7	3.25	3.4	4.5	4.95
					12.5	7.85	4.05	3.8	3.2	3.3	4.5	5.75
	3.6				12.85	7.35	4.2	3.9	3.1	3.35	4.4	6.6
					13.35	6.9	4.1	3.9	3.15	3.35	4.4	
					13.3	6.6	4.05	3.9	3.1	3.4	4.4	
					13.05	6.4	4.1	3.8	3.1	3.35		
		4.6			12.4	6.45	4.0	3.7	3.2	3.5	4.4	
			4.75		12.3	6.3	4.15	3.75	3.2	7.45		
					12.0	5.95	4.3	3.85	3.3	9.25		
	3.6			5.7	12.45	5.9	4.05	3.7	3.25	8.4		
					11.7	5.15	3.95	3.75	3.3	8.45	4.4	
					11.35	4.35	4.0	3.65	3.25	7.45		
					11.0	4.4	3.9	3.7	3.2	6.15		
		4.5			10.55	4.55	4.05	3.5	3.2	5.85	4.6	
			4.8	8.5	10.45	4.35	4.2	3.45	3.2	5.7		
				9.7	10.65	4.2	4.65	3.4	3.2	5.5	4.5	
	3.9			9.1	10.9	4.2	4.9	3.35	3.25	5.0	4.5	
				8.75	10.85	4.15	5.2	3.3	3.25	4.8	4.4	
				9.45	9.75	4.3	5.0	3.35	3.2	4.7	4.4	
	4.2			10.15	8.8	4.35	4.95	3.4	3.2	4.7	4.5	5.0
				10.75	8.2	4.9	4.85	3.2	3.2	4.65	4.4	
		4.5	4.75	9.9	7.8	5.2	4.5	3.3	3.3	4.65	4.4	

Daily gage height, in feet, of Aroostook River at Fort Fairfield, Me., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26				10.4	7.65	5.5	4.2	3.25	3.3	4.6	4.3	.....
27				11.05	7.75	5.35	4.05	3.3	3.25	4.65	4.4	.....
28				11.2	7.45	5.35	4.0	3.4	3.3	4.5	4.4	.....
29				10.95	7.1	5.45	4.15	3.4	3.2	4.6	4.4	.....
30				11.35	7.05	5.0	4.2	3.4	3.25	4.6	4.4	[illegible]
31	4.6				6.5	.....	4.4	3.4	.....	4.6	.....	.....

NOTE.—The following ice conditions prevailed during 1906: River frozen January 1 to April 17, inclusive, and December 6 to 31, inclusive; ice began to go out April 18. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 1	3.6	3.6	1.0	February 25	4.5	4.6	1.9
January 6	3.6	3.6	1.1	March 11	4.75	4.8	1.9
January 13	3.6	3.6	1.1	March 18	4.8	4.8	1.9
January 20[a]	3.9	3.9	1.6	March 25	4.75	4.8	1.9
January 23[a]	4.2	4.1	1.6	April 4	5.4	5.6	1.8
January 31	4.6	4.6	1.7	April 13	5.7	5.9	1.3
February 10	4.6	4.7	1.9	December 23	5.0	5.1	0.9
February 17	4.5	4.6	1.9	December 30	5.1	5.1	1.1

[a] Water above top of ice.

Rating table for Aroostook River at Fort Fairfield, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.10	180	4.40	1,664	5.70	4,019	8.00	9,500
3.20	240	4.50	1,822	5.80	4,222	8.20	10,100
3.30	310	4.60	1,984	5.90	4,427	8.40	10,710
3.40	380	4.70	2,150	6.00	4,635	8.60	11,330
3.50	480	4.80	2,320	6.20	5,060	8.80	11,960
3.60	580	4.90	2,494	6.40	5,495	9.00	12,600
3.70	690	5.00	2,672	6.60	5,940	10.00	15,910
3.80	810	5.10	2,854	6.80	6,395	11.00	19,400
3.90	940	5.20	3,040	7.00	6,865	12.00	23,000
4.00	1,075	5.30	3,230	7.20	7,345	13.00	26,700
4.10	1,215	5.40	3,423	7.40	7,840		
4.20	1,360	5.50	3,619	7.60	8,360		
4.30	1,510	5.60	3,818	7.80	8,910		

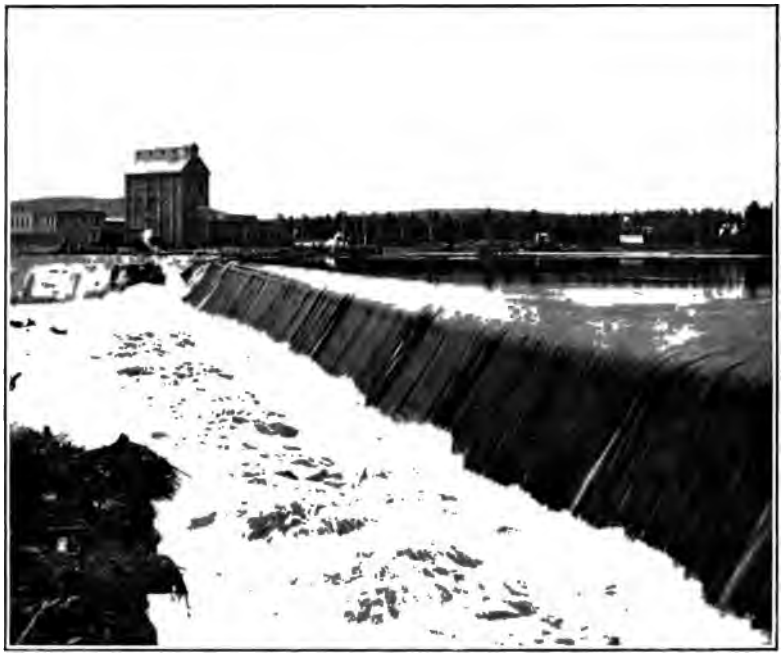
NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903-1906, and is well defined.

Monthly discharge of Aroostook River at Fort Fairfield, Me., for 1906.

[Drainage area, 2,230 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (18-30)	20,700	11,000	16,300	7.31	3.53
May	28,000	5,720	18,400	8.25	9.51
June	9,060	1,290	4,000	1.79	2.00
July	3,040	940	1,600	.718	.83
August	1,590	240	620	.278	.32
September	310	180	254	.114	.13
October	13,400	310	3,120	1.40	1.61
November	1,980	1,510	1,740	.780	.87
December (1-6)	5,940	1,660	2,940	1.32	.29

NOTE.—The above values are excellent.



A. PLANT OF ST. CROIX PAPER COMPANY AT SPRAGUE'S FALLS, MAINE.

B. SACO RIVER BELOW SALMON FALLS DAM, MAINE.

ST. CROIX RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

St. Croix River is formed by two branches; one, known as the upper St. Croix or Chiputneticook River, is the outlet of Schoodic Lakes, the other, Kennebasis River, is the outlet of the western lakes of the area, known as Kennebasis Lakes. The upper St. Croix, with its tributary lakes, forms nearly half of the eastern boundary of Maine, separating that State from New Brunswick. The total drainage area of the main stream is about 1,630 square miles, of which 920 square miles are tributary to the great reservoir systems controlled by dams at Vanceboro and Princeton. The length of the stream from the headwaters to the mouth is 100 miles. The basin is, in general, lower than that of any of the larger streams of the State flowing into the Atlantic, its headwaters having an elevation of about 540 feet. The fall from Chiputneticook (the lower of the Schoodic Lakes) to tide water, a distance of 54 miles, is, however, 382 feet, or 7 feet to the mile. At a number of places, where falls and rapids occur, water power has been or can easily be developed.

The lake surface area of the upper St. Croix is approximately 50 square miles and that of West Branch 70 square miles, taking into account only the principal lakes and ponds. Indeed, above Vanceboro and Princeton, each branch of the river is simply a succession of lakes to almost the extreme headwaters. Wells estimated the total lake surface of the St. Croix as not less than 150 square miles, or nearly one-tenth of the total basin. The drainage area at various points on the river is given in Water-Supply Paper No. 165, page 27.

There are on this stream favorable locations for paper and pulp mills, and during 1905 the St. Croix Paper Company developed Spragues Falls with a 6,000-horsepower installation of wheels, to utilize a head of from 40 to 44 feet.

ST. CROIX RIVER NEAR WOODLAND, ME.

This station was established December 4, 1902, at a point a short distance above Spragues Falls, now called Woodland, near Baring; on June 8, 1905, it was moved about 1½ miles downstream to avoid backwater effects caused by the building of a paper mill and dam at Spragues Falls (see Pl. III, *A*). The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 28, where are given also references to publications that contain data for previous years.

Discharge measurements of St. Croix River near Woodland, Me., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
June 14	F. E. Pressey	295	1,090	7.73	2,330
September 6	do	292	790	6.74	1,170
September 7	do	292	790	6.75	1,140
October 5	do	283	660	6.23	640
November 20[a]	do	288	785	6.69	985
1906.					
April 25	F. E. Pressey	315	1,920	10.46	7,650
April 25	do	315	1,930	10.50	7,790
May 25	do	311	1,460	8.75	3,370
August 27	do	298	1,080	7.60	1,630
November 7	do	296	1,010	7.56	1,980

[a] Anchor ice probably affected results.

Daily gage height, in feet, of St. Croix River near Woodland, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			8.8			9.2		8.7	7.2	7.0	8.3	
2	8.5						7.6	8.7		7.1	8.3	7.3
3					10.2		7.5	8.6	7.2	7.1		7.3
4					10.2	9.2	7.5	8.5	7.1	7.0		7.3
5	8.7			6.1	10.1	9.2	7.5		7.4	7.0	8.7	7.3
6					10.1	9.3	7.4		7.2	6.9	8.4	7.3
7					10.0	9.4	7.4	8.4	7.2		7.8	
8	8.7	8.9	8.9		9.9	9.3		8.3	7.0	6.9	7.7	
9					9.8	9.2	7.7	8.2		7.0	7.7	
10					9.7		7.9	8.1	7.0	7.2	7.7	
11					9.6	9.1	8.0		7.0	7.4		
12	8.7			7.9	9.4	9.0	8.1		7.1	7.5	7.7	7.7
13						8.8	8.2	8.0	7.1	7.5	7.7	7.7
14					9.1	8.7	8.2	7.9	7.1		7.4	7.7
15					8.8	8.7		7.9	7.1	7.6	7.5	7.7
16			8.6		8.7	8.6	8.3	7.8		7.7	7.7	
17		9.4			8.7		8.4	7.8	7.0	7.8	7.8	7.5
18				10.2	8.6	8.5	8.4	7.8	7.0	7.9		
19	9.4	9.4				8.2	8.5		6.9	7.9	7.8	
20						8.0	8.5		6.9	7.9	7.8	7.7
21					8.5	7.8		7.6	7.1		7.8	7.7
22			9.4		8.5	7.7		7.5		8.0	7.7	7.6
23		9.4		10.4	8.5		8.4	7.4		8.1	7.6	
24				10.4	8.4		8.4	7.45	7.3	8.1		
25					8.4	7.7	8.4	7.4	7.4	8.2		7.5
26	12.9			10.6	8.4	7.6	8.4		7.5	8.2	6.6	7.6
27				10.6		7.6	8.3		7.6	8.2	7.0	
28			9.3		9.0	7.6	8.3	7.3	6.4		7.3	7.7
29					9.6	7.7		7.2	6.4	8.2	7.5	
30					9.6	7.8	8.5	7.2		8.3	7.5	
31	10.0				9.4		8.6	7.2		8.3		

NOTE.—The following ice conditions prevailed during 1906: River frozen January 1-26; ice partly went out on the latter date; again frozen from about February 1 to April 15; river clear of ice April 26. In December some ice formed near the gage, but the river did not freeze over. During the frozen period gage heights were taken to water surface through a hole in the ice.

The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 8	8.7	.....	1.8	March 1	8.8	8.9	1.55
January 19	9.4	.....	1.4	March 8	8.9	8.9	1.5
January 26 [a]	12.9	.....	.....	March 16	8.6	9.4	1.6
January 31	10.0	.....	.6	March 22	9.4	9.4	1.6
February 9	8.9	8.9	1.3	March 28	9.3	9.3	1.6
February 17	9.4	9.4	1.6	April 5	6.1	.....	([b])
February 23	9.4	9.5	1.6				

[a] Ice all gone in midstream. [b] No ice at gage.

Rating table for St. Croix River near Woodland, Me., from July 1 to May 14, 1905, and October 26 to December 31, 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
6.00	480	7.00	1,360	8.00	2,660	9.00	4,390
6.10	545	7.10	1,470	8.10	2,810	9.20	4,790
6.20	615	7.20	1,590	8.20	2,970	9.40	5,210
6.30	690	7.30	1,710	8.30	3,130	9.60	5,640
6.40	770	7.40	1,830	8.40	3,300	9.80	6,090
6.50	860	7.50	1,960	8.50	3,470	10.00	6,550
6.60	950	7.60	2,090	8.60	3,650	10.20	7,020
6.70	1,050	7.70	2,230	8.70	3,830		
6.80	1,150	7.80	2,370	8.80	4,010		
6.90	1,250	7.90	2,510	8.90	4,200		

NOTE.—The above table is applicable only for open-channel conditions. It is based on eight discharge measurements made during 1905–6 and is fairly well defined between gage heights 6.2 feet and 11 feet. From about May 15 to about October 25, 1906, the flow was affected by backwater, the table has been applied during this period by taking the discharge as that given for a gage height 0.3 foot lower than the observed height.

Monthly discharge of St. Croix River near Woodland, Me., for 1905–6.

[Drainage area, 1,420 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
July	4,390	2,660	3,210	2.26	2.61
August	2,370	1,050	1,420	1.00	1.15
September	1,150	690	964	.679	.76
October	690	480	549	.387	.45
November	1,250	480	756	.532	.59
1906.					
May	7,020	2,810	4,670	3.29	3.79
June	4,590	1,710	3,090	2.18	2.43
July	3,130	1,470	2,410	1.70	1.96
August	3,300	1,250	2,100	1.48	1.71
September	1,710	545	1,150	.810	.90
October	3,130	950	2,020	1.42	1.64
November	3,830	950	2,310	1.63	1.82
December	2,230	1,710	2,040	1.44	1.66

NOTE.—Values for 1905 are rated as follows: October, good; remainder of 1905, excellent. Values for 1906 are rated as follows: All months good, except September and October, which are fair, owing to errors in gage height observations.

MACHIAS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Machias may be taken as fairly representative of several of the smaller streams of Maine which empty their waters directly into the ocean and which are commonly referred to as "coastal rivers." Its total drainage basin is 495 square miles, nearly all of which lies in Washington County, Me. Its extreme headwaters lie at an elevation of nearly 500 feet, and are not more than 50 miles from tide water. Wells listed 20 lakes in this basin, aggregating 29.5 square miles in area of water surface. Without important exception these lie, however, in the extreme headwaters. Dams are maintained at several of the outlets of the lakes, and the stored water is used for log driving.

MACHIAS RIVER NEAR WHITNEYVILLE, ME.

This station was established October 17, 1903, at the bridge of the Washington County Railway, near Whitneyville. The drainage area at this point is 465 square miles. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 30, where are given also references to publications that contain data for previous years. The original gage, of the standard chain type, was attached to the guard timber on the downstream side of the railroad bridge, but on October 3, 1905, a vertical wooden staff gage was placed on one of the piers of the wooden highway bridge, about one-half mile upstream from the railroad bridge, and all gage heights given below are by this new gage, which is read by Ira S. Albee. The bench mark is a marked point on an outcropping ledge 25 feet downstream from the bridge on the left bank; elevation, 15.54 feet; the reference point is a marked point on a timber behind the gage; elevation, 9.33 feet. Elevations refer to datum of gage. Measurements are made from the railroad bridge, as formerly.

Discharge measurements of Machias River near Whitneyville, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 24	F. E. Pressey	124	1,050	7.01	2,710
May 24	do	126	830	5.49	1,460
August 28	do	125	605	3.45	315
November 8	do	125	650	4.11	535

Daily gage height, in feet, of Machias River near Whitneyville, Me., for 1905.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
.....	3.6	2.9	4.25	17.....	3.3	4.85	4.05
.....	3.55	3.8	4.1	18.....	3.25	4.85	3.95
.....	3.4	4.5	5.1	19.....	3.1	4.4	3.85
.....	3.35	4.35	6.55	20.....	2.9	4.1	3.8
.....	3.3	4.45	6.9	21.....	3.3	3.9	3.9
.....	3.2	4.5	5.1	22.....	3.0	3.8	4.05
.....	2.9	4.85	4.8	23.....	3.4	3.7	4.55
.....	2.8	4.8	4.35	24.....	3.35	3.7	4.4
.....	3.2	4.8	4.1	25.....	3.4	3.6	4.45
.....	3.2	4.7	4.1	26.....	3.3	3.6	4.1
.....	3.2	4.2	4.0	27.....	3.2	3.5	4.0
.....	3.25	3.6	3.8	28.....	3.25	3.45	3.9
.....	3.3	3.75	3.9	29.....	2.85	3.45	3.8
.....	3.3	3.7	4.35	30.....	3.05	4.2	4.4
.....	3.0	3.7	4.55	31.....	3.0	.....	.....
.....	3.35	3.6	4.3				

Daily gage height, in feet, of Machias River near Whitneyville, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.8	4.6	4.5	6.8	7.7	7.8	5.8	4.2	3.2	3.0	3.7	4.1
.....	4.4	4.6	4.4	6.0	7.7	7.4	5.3	4.0	3.2	3.0	4.0	4.2
.....	4.4	4.6	4.3	5.4	7.6	7.6	4.8	3.7	3.2	3.0	5.0	4.4
.....	4.5	4.4	6.7	5.2	7.4	7.5	4.8	3.7	3.2	2.9	5.2	4.2
.....	5.4	4.2	6.6	5.4	7.2	7.2	5.1	3.8	3.2	2.9	4.8	3.8
.....	5.4	4.1	5.7	5.9	7.2	7.1	5.3	3.6	3.2	2.5	4.4	3.8
.....	5.0	4.0	5.1	6.1	7.9	7.4	5.0	3.7	3.2	2.7	4.2	3.9
.....	4.6	4.0	4.8	5.8	7.9	7.7	4.7	3.6	3.1	2.8	4.0	3.9
.....	4.3	4.2	4.8	5.3	7.2	7.5	4.6	3.6	3.0	3.4	4.0	4.0
.....	4.1	4.2	6.8	5.2	6.7	7.2	4.6	3.6	3.0	3.7	3.95	4.0
.....	3.9	4.3	6.2	5.1	6.5	6.8	4.7	3.6	3.1	4.0	4.5	4.0
.....	4.0	4.3	5.7	4.8	7.0	6.1	6.7	4.5	3.1	4.6	5.3	3.9
.....	3.8	4.1	5.1	4.6	7.0	5.6	6.9	4.4	3.2	4.4	5.9	3.9
.....	3.9	4.2	4.7	4.9	7.0	5.5	7.1	4.0	3.6	4.4	5.3	4.0
.....	4.1	4.2	4.5	6.3	6.1	5.5	6.3	3.7	3.9	4.2	4.6	3.9
.....	4.3	4.1	4.4	9.8	5.8	5.4	5.4	3.6	3.9	3.9	5.0	4.0
.....	7.4	4.1	4.4	9.4	5.4	5.3	5.1	3.5	3.8	3.8	5.5	4.0
.....	7.3	4.1	4.3	8.4	5.7	5.0	4.4	3.5	3.6	3.7	5.3	4.0
.....	6.8	4.0	4.2	8.1	6.1	5.2	4.3	3.6	3.6	3.6	5.0	4.0
.....	6.2	4.0	4.5	7.1	6.2	5.3	4.2	3.6	3.5	3.5	5.0	4.0
.....	5.9	3.9	4.4	6.5	5.9	5.1	4.0	3.5	3.2	3.5	4.7	4.2
.....	6.0	4.0	4.4	6.8	5.8	4.8	4.2	3.5	3.1	3.4	4.6	5.6
.....	6.2	4.1	4.4	6.8	5.7	4.8	4.2	3.6	3.0	3.3	4.7	6.0
.....	6.3	4.0	4.3	7.1	5.5	5.1	4.1	3.5	3.1	3.4	4.6	5.6
.....	6.4	4.0	4.3	8.0	5.4	5.4	4.1	3.5	3.0	3.4	4.4	5.4
.....	6.4	4.4	4.2	7.8	5.5	5.3	4.0	3.4	3.0	3.6	4.3	5.2
.....	6.3	5.4	4.3	7.5	5.6	5.0	4.0	3.4	3.0	4.0	4.2	5.2
.....	6.1	5.4	5.4	7.2	7.9	5.2	4.0	3.4	3.0	4.0	4.1	4.9
.....	5.7	.....	6.4	7.2	9.5	5.3	3.9	3.4	3.0	3.8	4.0	4.8
.....	5.3	.....	6.7	7.1	9.4	5.8	4.0	3.3	3.0	3.7	4.5	4.6
.....	4.9	.....	6.8	.....	8.4	.....	4.1	3.2	.....	3.6	.....	4.4

E.—The river does not usually freeze at or near the gage, and the flow is probably not greatly d by ice conditions.

PENOBSCOT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Penobscot basin, which has a total area of about 8,500 square miles, lies wholly in Maine. It extends from the Atlantic Ocean on the south to the basin of the St. John on the north, a distance of 160 miles, and from the New Brunswick boundary on the east to the Quebec boundary on the west, a distance of 115 miles. The general elevation of the basin is lower than that of the drainage basins to the west. The headwaters of the main river lie in the mountainous region on the boundary of Quebec, at an elevation of nearly 2,000 feet. The slopes of the upper tributaries are generally steep. Chesuncook Lake lies near the center of the basin at an elevation of 930 feet. From this point to tide water the distance along the river is about 121 miles, indicating an average slope of 7.7 feet to the mile. This is concentrated at intervals by ledges where water power has been or may be developed. The water from about 800 square miles of the basin is discharged into the main river below its lowest available water power at Bangor. The drainage areas of the principal tributaries are given in Water-Supply Paper No. 165, page 33.

RIVER SURVEYS IN PENOBSCOT DRAINAGE.

In order to point out the power and storage possibilities in the Penobscot River drainage basin, surveys have been made as follows: From tide water to Seboomook Falls, near Northwest Carry, for the determination of the profile and plan of the river.

From the data collected sheets have been prepared showing, as far as available, profile of water surface, plan of the river, contours along the banks, and prominent natural or artificial features. The results of these surveys have been published on sheets and may be had on application to the Director of the Geological Survey.

PENOBSCOT RIVER AT MILLINOCKET, ME.

The discharge of Penobscot River at Millinocket has been computed and the data furnished by H. S. Ferguson, engineer for the Great Northern Paper Company. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 33, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Penobscot River at Millinocket, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	342	992	656	548	2,541	5,071	7,619	5,830	2,042	2,054	2,075	2,041
.....	363	833	643	634	2,511	5,051	7,708	6,329	(a)	2,041	2,071	(a)
.....	351	943	674	636	2,511	4,836	2,431	4,015	1,999	2,043	2,059	(a)
.....	364	480	571	636	2,511	4,579	3,554	3,641	(a)	2,039	(a)	2,051
.....	349	998	791	616	2,508	4,236	4,062	3,699	1,994	2,042	2,009	2,044
.....	368	918	782	637	(a)	6,047	2,752	3,983	1,983	2,028	2,055	2,043
.....	195	843	784	628	2,482	2,944	2,531	4,015	1,984	(a)	2,025	2,027
.....	349	607	821	556	2,493	2,911	5,155	4,104	2,035	1,983	2,082	2,044
.....	343	686	785	644	2,493	3,328	4,882	4,614	(a)	2,043	2,083	1,988
.....	355	835	776	624	2,702	5,973	2,534	4,540	2,039	2,034	2,078	2,044
.....	360	554	549	641	2,516	6,155	2,521	4,270	2,036	2,031	(a)	1,993
.....	358	800	789	636	2,671	6,028	3,927	4,027	2,034	(a)	2,057	2,019
.....	355	802	792	640	4,138	4,797	5,402	4,062	2,039	2,042	2,075	2,030
.....	259	763	704	637	5,422	2,753	4,588	3,334	2,055	(a)	2,074	2,025
.....	374	634	551	520	9,400	3,510	2,893	2,575	2,032	2,038	2,075	2,022
.....	373	645	795	1,122	15,769	6,551	2,479	2,575	2,030	2,040	2,074	(a)
.....	374	791	618	1,061	17,972	3,667	2,504	2,575	2,041	2,030	2,062	2,032
.....	363	516	634	1,030	18,635	3,737	2,502	2,575	2,039	2,045	(a)	2,032
.....	357	811	802	1,198	18,110	4,781	2,492	2,618	2,035	2,042	2,050	2,030
.....	363	640	801	1,202	15,819	4,573	2,494	2,575	2,044	2,034	2,054	2,033
.....	230	657	651	1,249	11,154	6,230	2,492	2,575	2,024	(a)	2,063	2,047
.....	343	818	646	1,055	4,068	6,694	3,322	2,575	2,032	2,033	2,056	2,004
.....	347	647	654	2,036	6,815	5,313	2,502	2,299	(a)	2,037	2,055	2,024
.....	350	825	653	2,044	11,800	3,495	2,421	2,030	2,029	2,032	2,056	(a)
.....	352	483	557	2,372	9,376	6,062	2,493	2,043	2,031	2,038	(a)	(a)
.....	360	795	652	2,494	6,655	6,380	2,513	(a)	2,052	2,039	(a)	(a)
.....	356	790	636	2,490	5,505	6,314	2,690	2,035	2,040	2,045	(a)	2,045
.....	257	786	637	2,502	5,885	4,250	4,188	2,037	2,045	(a)	2,043	2,051
.....	726	.....	635	(a)	5,379	5,428	3,692	2,030	2,025	2,065	2,039	2,063
.....	1,075	.....	643	2,495	6,319	2,887	5,556	2,031	(a)	2,032	2,031	2,055
.....	1,195	.....	635	.....	5,098	.....	5,578	2,028	.....	2,032	.....	2,057

a Owing to incompleteness of records discharge rate can not be computed.

Monthly discharge of Penobscot River at Millinocket, Me., for 1906.

[Drainage area, 1,880 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
anuary	1,200	195	403	0.214	0.25
ebruary	998	480	746	.397	.41
larch	821	549	688	.366	.42
pril	2,500	520	1,200	.638	.71
lay	18,600	2,480	6,900	3.67	4.23
une	6,690	2,750	4,820	2.56	2.86
uly	7,710	2,420	3,630	1.93	2.22
ugust	6,330	2,030	3,220	1.71	1.97
eptember	2,050	1,980	2,030	1.08	1.20
ctober	2,060	1,980	2,040	1.09	1.26
ovember	2,080	2,010	2,060	1.10	1.23
ecember	2,060	1,990	2,030	1.08	1.24
The year	18,600	195	2,480	1.32	18.00

NOTE.—Discharges for missing days have been interpolated.

PENOBSCOT RIVER AT WEST ENFIELD, ME.

This station was established November 5, 1901, and prior to 1904 was designated as being at Montague, Me. In 1904 the name of this village was changed to West Enfield. The gaging station is located at the steel highway bridge, about 1,000 feet below the mouth of

Piscataquis River. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 35, where are given also references to publications that contain data for previous years.

Discharge measurements of Penobscot River at West Enfield, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
September 22 [a]	University of Maine students, under direction of Prof. H. S. Boardman	690	2,640	2.60	4,130
September 26 [a]	do	670	2,500	2.40	3,640
September 29 [a]	do	665	2,510	2.30	3,590
October 4 [a]	do	650	2,320	2.10	3,210
October 6 [a]	do	625	2,230	2.05	2,940
October 11 [a c]	do	865	6,800	6.80	18,600
October 13 [b]	do	850	5,300	5.60	12,600
October 24	do	843	4,040	4.15	8,330
October 31 [b]	do	860	5,340	5.65	12,800

[a] Average of three measurements.
[b] Average of two measurements.
[c] Gage height at beginning 6.5 feet, at end 7.1 feet; poor measurement.

Daily gage height, in feet, of Penobscot River at West Enfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1					11.45	7.65	4.25	4.5	3.45	2.1	5.45	4.2
2	2.3				11.95	7.5	3.75	4.4	3.0	2.2	5.4	4.35
3				[a] 5.8	12.35	7.45	4.55	4.25	2.95	2.2	5.85	4.7
4				5.9	12.5	7.55	4.25	4.0	3.15	2.1	6.15	5.1
5				6.05	12.4	7.3	4.5	3.9	3.4	2.0	5.95	6.0
6		4.9	3.9	6.25	12.35	7.2	4.7	3.75	3.25	2.1	5.65	6.0
7				6.6	12.25	7.7	4.25	3.65	3.1	2.1	5.4	6.0
8				6.7	12.3	6.9	4.4	3.85	3.0	2.3	5.1	5.9
9	2.2			6.65	12.1	6.8	5.15	3.95	2.75	2.3	5.0	5.9
10				6.7	12.25	6.7	4.85	4.05	2.6	2.8	4.75	5.9
11				6.75	13.4	6.65	4.25	3.9	2.6	6.3	4.7	5.7
12				6.3	12.2	6.65	3.75	3.95	2.65	6.6	4.7	.....
13		4.6		6.1	11.45	6.4	4.65	3.7	2.5	5.55	4.8	.....
14			4.4	6.3	11.35	5.4	5.5	3.6	2.6	5.0	4.7	.....
15				6.85	11.65	4.5	5.2	3.35	2.55	4.5	4.9	.....
16	2.8			9.4	11.2	4.05	4.5	3.35	2.4	4.35	5.0	.....
17				11.45	11.6	4.25	4.15	3.35	2.4	4.15	5.25	5.0
18				12.15	11.3	4.7	4.15	3.4	2.3	3.9	5.25	.....
19			4.1	12.05	11.4	4.7	4.05	3.05	2.3	3.75	5.25	.....
20				11.95	10.75	4.75	4.0	3.3	2.35	3.55	5.5	.....
21				11.6	10.0	4.9	4.0	3.4	2.6	3.45	5.4	.....
22		3.8		11.65	8.85	5.55	4.05	3.5	2.55	3.5	5.5	.....
23	3.8			11.65	7.8	5.85	4.5	3.55	2.3	3.75	5.35	.....
24	5.2			11.25	8.35	5.4	4.4	3.8	2.4	4.15	5.25	6.0
25	6.6			10.8	8.75	5.05	4.3	3.5	2.4	4.4	4.75	.....
26	7.3		4.0	10.8	8.2	5.45	4.05	3.3	2.35	5.4	4.5	.....
27		4.1	4.2	10.85	7.75	5.05	3.85	3.45	2.35	6.0	4.4	.....
28				10.9	7.65	4.7	3.75	3.65	2.3	6.05	4.0	.....
29				11.1	7.8	4.35	4.0	3.8	2.3	6.2	4.0	.....
30	6.0			11.25	8.0	4.7	3.5	3.9	2.2	6.15	4.25	.....
31					8.15		4.2	4.1		5.6		5.5

NOTE.—The following ice conditions prevailed during 1906:

River frozen from January 1 to April 15, except that narrow channel remained open near the right bank; river again frozen December 4-31, inclusive.

During frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 2	2.3	.....	0.9	March 6	3.9	4.0	(a)
January 9	2.2	.....	1.0	March 14	4.4	4.0	(a)
January 16	2.8	.....	0.9	March 19	4.1	4.2	1.8
January 23	3.8	4.0	0.8	March 26	4.0	3.9	1.7
January 25	6.6	6.8	0.6	April 3 [b]	.....	5.8	.....
January 30	6.0	6.2	0.6	December 10	5.9	5.7	[c] 0.6
February 8	4.65	4.7	1.2	December 17	5.0	5.1	[c] 0.8
February 13	4.6	4.7	1.3	December 24	6.0	6.1	[c] 0.8
February 22	3.8	3.9	1.0	December 31	5.5	5.6	[c] 0.6
February 27	4.1	4.2	(a)				

[a] Open water in places and water on ice; unsafe to go upon.
[b] River open on east side under gage.
[c] River not entirely frozen over.

Rating table for Penobscot River at West Enfield, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	3,000	3.30	5,740	4.60	9,430	6.80	17,300
2.10	3,170	3.40	5,990	4.70	9,750	7.00	18,260
2.20	3,350	3.50	6,240	4.80	10,070	7.20	19,170
2.30	3,530	3.60	6,500	4.90	10,390	7.40	20,120
2.40	3,720	3.70	6,770	5.00	10,720	7.60	21,110
2.50	3,920	3.80	7,050	5.20	11,380	7.80	22,140
2.60	4,130	3.90	7,330	5.40	12,060	8.00	23,200
2.70	4,340	4.00	7,620	5.60	12,750	9.00	29,000
2.80	4,560	4.10	7,910	5.80	13,460	10.00	35,450
2.90	4,790	4.20	8,210	6.00	14,200	11.00	42,350
3.00	5,020	4.30	8,510	6.20	14,960	12.00	49,750
3.10	5,260	4.40	8,810	6.40	15,740	13.00	57,600
3.20	5,500	4.50	9,120	6.80	16,550	13.40	60,800

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1901-6 and is well defined.

Monthly discharge of Penobscot River at West Enfield, Me., for 1906.

[Drainage area, 6,630 square miles.[a]]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (16-31)	50,900	31,500	44,300	6.68	3.73
May	60,800	21,400	40,600	6.12	7.06
June	21,600	7,760	14,100	2.13	2.38
July	12,400	6,240	8,560	1.29	1.49
August	9,120	5,140	6,850	1.03	1.19
September	6,120	3,350	4,240	.640	.71
October	16,600	3,000	8,230	1.24	1.43
November	14,800	7,620	11,000	1.66	1.85

[a] Includes Chamberlain Lake drainage. (See description of St. John River drainage basin, Water-Supply Paper. No. 165, p. 20.)

NOTE.—The above values are rated as excellent.

EAST BRANCH PENOBSCOT RIVER AT GRINDSTONE, ME.

This station was established October 23, 1902. It is located at the Bangor and Aroostook Railroad bridge, one-half mile south of the railroad station. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 38, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of East Branch Penobscot River at Grindstone, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	9.4	7.1	4.85	4.6	6.0	4.9	4.75	5.3
2	.....	5.4	.....	.....	9.6	7.2	5.45	4.5	5.9	4.9	4.9	5.3
3	.....	.....	5.6	.....	9.7	7.9	6.2	4.6	5.7	4.8	5.05	5.2
4	.....	.....	.....	.....	9.8	7.1	6.85	4.5	5.6	4.8	5.2	5.15
5	.....	5.1	.....	.....	9.85	8.4	6.65	4.5	5.45	4.7	5.35	5.1
6	4.5	.....	5.15	6.3	9.9	8.25	6.7	4.4	5.3	4.6	5.45	5.0
7	.....	.....	.....	.....	10.25	8.65	7.85	4.35	5.15	4.6	5.7	4.95
8	.....	.....	.....	.....	10.4	8.7	7.8	4.35	5.1	4.7	5.8	4.9
9	.....	.....	.....	.....	9.9	8.65	7.85	4.2	5.0	4.7	5.9	4.85
10	.....	5.1	.....	.....	9.6	8.65	7.5	4.25	4.9	5.05	6.3	4.85
11	.....	.....	.....	.....	9.3	8.7	7.45	4.3	4.9	5.85	6.25	4.8
12	.....	.....	.....	5.7	9.3	8.65	7.4	4.4	4.8	6.4	6.1	4.8
13	.....	.....	5.2	.....	9.3	7.35	7.7	4.4	4.8	6.8	6.0	4.7
14	.....	.....	.....	.....	9.3	7.75	7.85	4.4	4.7	6.7	6.0	4.7
15	.....	.....	.....	.....	9.0	7.25	7.65	4.35	4.7	6.5	5.95	4.7
16	4.5	.....	.....	8.3	9.0	6.85	7.65	4.3	4.7	6.4	5.9	4.6
17	.....	.....	.....	.....	9.0	6.55	7.6	4.25	4.7	6.15	5.9	4.5
18	.....	.....	5.2	8.7	8.8	7.8	7.5	4.2	4.8	6.1	5.85	4.5
19	.....	.....	.....	.....	8.7	6.55	7.3	4.2	4.85	5.8	5.9	4.45
20	.....	5.0	.....	.....	8.6	6.45	7.35	4.1	4.9	5.55	5.95	4.4
21	.....	.....	.....	8.7	8.55	6.4	7.35	4.1	5.0	5.45	6.15	4.4
22	5.0	.....	.....	8.7	9.3	6.5	7.1	4.2	5.1	5.4	6.25	4.4
23	.....	.....	.....	8.7	9.0	5.6	7.3	4.2	5.1	5.2	6.2	4.4
24	.....	.....	.....	7.8	8.7	5.85	6.9	4.2	5.1	5.15	6.1	4.4
25	.....	.....	6.3	8.05	8.9	5.75	6.55	4.2	5.05	5.1	5.9	4.4
26	.....	.....	.....	8.4	8.75	5.45	6.4	4.5	5.0	5.0	5.85	4.4
27	.....	.....	.....	8.7	8.8	5.25	6.2	4.65	5.0	5.05	5.75	4.3
28	.....	.....	.....	8.9	8.4	5.4	6.15	4.9	4.95	5.15	5.7	4.3
29	.....	.....	.....	9.1	8.35	4.85	5.75	5.3	4.9	5.05	5.6	4.3
30	.....	.....	.....	9.35	7.3	4.85	5.25	5.45	4.8	4.9	5.5	4.3
31	.....	.....	.....	.....	7.2	.....	4.85	5.75	.....	4.8	.....	4.3

NOTE.—The following ice conditions prevailed during 1906: River frozen January 1 to April 21, and November 25 to December 31, inclusive. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 6	4.5	4.5	0.8	March 25	6.3	6.3	2.0
January 16	4.5	4.5	.9	April 6	6.3	6.3	1.8
January 22	5.0	5.0	.9	April 12	5.7	5.7	1.4
February 2	5.4	5.4	.9	April 16	8.3	8.3	1.2
February 5	5.1	5.1	1.2	November 25	5.85	.....	.1
February 10	5.1	5.1	1.4	December 2	5.3	.....	.2
February 20	5.0	5.0	1.8	December 9	4.85	.....	.3
March 3	5.6	5.6	2.1	December 16	4.6	.....	.8
March 6	5.15	5.15	1.9	December 23	4.4	4.4	1.0
March 13	5.2	5.2	2.0	December 30	4.3	.....	1.2
March 18	5.2	5.2	2.0				

Gage heights were probably affected by log jams on Grindstone Falls during June and up to July 26, when the river was reported clear. From August 27 to October 16, inclusive, a jam of poles and ties at the bridge was reported.

Rating table for East Branch of Penobscot River at Grindstone, Me., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.10	210	5.30	855	6.50	2,285	8.40	6,110
4.20	240	5.40	940	6.60	2,445	8.60	6,630
4.30	275	5.50	1,030	6.70	2,610	8.80	7,190
4.40	315	5.60	1,130	6.80	2,780	9.00	7,780
4.50	360	5.70	1,235	6.90	2,955	9.20	8,380
4.60	405	5.80	1,345	7.00	3,130	9.40	8,980
4.70	455	5.90	1,460	7.20	3,495	9.60	9,580
4.80	510	6.00	1,580	7.40	3,880	9.80	10,180
4.90	570	6.10	1,705	7.60	4,285	10.00	10,780
5.00	630	6.20	1,840	7.80	4,710	10.20	11,380
5.10	700	6.30	1,980	8.00	5,155	10.40	12,000
5.20	775	6.40	2,130	8.20	5,620		

NOTE.—The above table is applicable only for open-channel conditions. It is based on thirteen discharge measurements made during 1902–5 and is well defined.

Monthly discharge of East Branch Penobscot River at Grindstone, Me., for 1906.

[Drainage area, 1,130 square miles.[a]]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April 21–30	8,830	4,710	6,810	6.03	2.24
May	12,000	3,500	8,150	7.21	8.31
June	6,900	540	3,540	3.13	3.49
July	4,820	540	3,100	2.74	3.16
August	1,290	210	377	.334	.39
September	1,580	455	708	.627	.70
October	2,780	405	1,040	.920	1.06
November 1–24	1,980	482	1,380	1.22	1.09

[a] Includes Chamberlain Lake drainage. See description of St. John River drainage basin, pp. 22–23.

NOTE.—Values are rated as follows: April and May, excellent; June to October, fair; November, good.

MATTAWAMKEAG RIVER AT MATTAWAMKEAG, ME.

This station was established August 26, 1902. It is located at the Maine Central Railroad bridge in the village of Mattawamkeag. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 41, where are given also references to publications that contain data for previous years.

A measurement was made August 23, 1906, by F. E. Pressey, with the following results:

Width, 257 feet; area, 220 square feet; gage height, 3.08 feet; discharge, 250 second-feet.

Daily gage height, in feet, of Mattawamkeag River at Mattawamkeag, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	8.7	.....	9.7	10.4	7.2	4.45	3.6	3.35	2.7	6.2	5.4
2	.....	8.4	.....	.....	10.6	7.05	4.2	3.8	3.25	2.6	6.1	5.45
3	.....	8.0	.....	.....	10.7	6.7	4.0	3.8	3.2	2.6	6.0	5.5
4	.....	7.7	9.2	.....	10.8	6.8	4.2	3.75	3.3	2.6	6.0	.....
5	.....	.....	.....	.....	11.05	7.35	4.5	3.7	3.6	2.6	6.1	.....
6	.....	.....	.....	.....	11.1	7.1	4.35	3.7	3.6	2.5	6.2	.....
7	3.7	.....	.....	.....	11.1	6.9	4.4	3.7	3.7	2.7	6.05	.....
8	.....	9.5	.....	9.9	11.1	6.7	4.25	3.65	3.6	3.0	5.9	.....
9	.....	.....	.....	.....	10.9	6.6	3.95	3.6	3.5	3.3	5.8	5.7
10	.....	.....	.....	.....	10.7	6.2	4.2	3.45	3.5	3.65	5.85	.....

Daily gage height, in feet, of Mattawamkeag River at Mattawamkeag, Me., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11					10.7	5.8	4.1	3.4	3.4	4.4	6.0	
12			8.5		10.4	5.4	4.2	3.4	3.4	5.75	6.0	
13		9.5			10.1	4.9	4.3	3.4	3.2	6.0	5.9	
14	3.7			8.6	9.9	4.6	4.4	3.35	3.1	6.0	5.8	
15				8.6	9.95	4.45	4.5	3.3	3.0	5.9	5.8	
16				9.8	9.55	4.3	4.4	3.3	3.0	5.8	5.8	6.6
17				9.6	9.25	4.1	4.3	3.3	2.8	5.65	5.9	
18			8.6	9.75	8.9	3.9	4.3	3.3	2.6	5.45	5.9	
19				10.1	8.8	3.8	4.2	3.3	2.5	5.2	6.0	
20		8.8		10.55	8.25	4.05	4.2	3.2	2.6	4.85	6.2	
21				10.65	7.5	4.65	4.5	3.1	2.6	4.8	6.3	
22	3.8			10.7	7.2	5.05	4.2	3.05	2.6	4.7	6.3	
23				10.7	7.05	5.5	4.2	3.15	2.65	4.8	6.2	6.9
24				10.75	7.4	5.6	4.2	3.2	2.7	5.0	6.1	
25	11.6	9.3	8.4	10.8	7.2	5.6	4.2	3.2	2.7	5.1	6.0	
26	11.6			10.6	6.55	5.6	4.2	3.2	2.7	5.55	5.8	
27	11.4			10.6	6.5	5.2	4.2	3.2	2.7	5.95	5.7	
28	11.05			10.4	6.4	4.9	4.1	3.3	2.7	6.15	5.7	
29	11.0			10.4	6.45	4.8	4.1	3.4	2.7	6.3	5.5	
30	10.75			10.3	6.8	4.55	3.85	3.45	2.7	6.2	5.3	6.7
31	9.0				6.8		3.7	3.5		6.2		

NOTE.—The following ice condition prevailed during 1906: River frozen over January 1 to 24; open January 25 to February 3; frozen February 4 to April 13; clear of ice April 17. River frozen December 4 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 7	3.7	3.7	1.1	March 12	8.5	8.7	1.2
January 14	3.7	3.7	1.3	March 18	8.6	8.7	1.5
January 22	3.8	3.8	1.5	March 25	8.4	8.5	1.4
February 4	7.7	7.7	.6	April 1	9.8	9.7	1.2
February 8	9.5	9.7	.8	April 8		9.9	
February 13	9.5	9.3	.8	December 9	5.7	5.8	.5
February 20	8.8	8.6	1.1	December 16	6.6	6.7	.7
February 25	9.3	9.5	.9	December 23	6.9	7.0	.9
March 4	9.2	9.4	1.0	December 30	6.7	6.8	1.0

Rating table for Mattawamkeag River at Mattawamkeag, Me., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.50	86	3.90	590	5.20	1,949	7.00	5,075
2.60	100	4.00	660	5.30	2,083	7.20	5,495
2.70	114	4.10	736	5.40	2,219	7.40	5,920
2.80	134	4.20	818	5.50	2,359	7.60	6,360
2.90	160	4.30	906	5.60	2,505	7.80	6,810
3.00	190	4.40	1,000	5.70	2,658	8.00	7,275
3.10	223	4.50	1,100	5.80	2,818	8.20	7,750
3.20	258	4.60	1,206	5.90	2,985	8.40	8,235
3.30	295	4.70	1,318	6.00	3,160	8.60	8,730
3.40	334	4.80	1,436	6.20	3,525	8.80	9,235
3.50	375	4.90	1,559	6.40	3,900	9.00	9,750
3.60	420	5.00	1,687	6.60	4,285	10.00	12,520
3.70	470	5.10	1,817	6.80	4,675	11.00	15,590
3.80	525						

NOTE.—The above table is applicable only for open-channel conditions. It is based on twenty-three discharge measurements made during 1902–6 and is well defined between gage heights 2.6 feet and 9.5 feet.

Monthly discharge of Mattawamkeag River at Mattawamkeag, Me., for 1906.

[Drainage area, 1,510 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
(17-30)	14,900	11,400	13,800	9.14	4.76
	15,900	3,900	10,300	6.82	7.86
	5,810	525	2,650	1.75	1.95
	1,100	470	834	.552	.64
ıst	525	206	345	.228	.26
ımber	470	86	223	.148	.17
ber	3,710	86	1,720	1.14	1.31
ımber	3,710	2,080	3,080	2.04	2.28

TE.—Values for 1906 are rated as excellent.

PISCATAQUIS RIVER NEAR FOXCROFT, ME.

'his station was established August 17, 1902. It is located at v's bridge, about halfway between Guilford and Foxcroft. The ditions and the bench marks are described in Water-Supply Paper 165, page 44, where are given also references to publications that tain data for previous years.

Discharge measurements of Piscataquis River near Foxcroft, Me., in 1906.

Date	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
st 22	F. E. Pressey	100	210	2.73	320
st 31	do	102	205	2.81	330

Daily gage height, in feet, of Piscataquis River near Foxcroft, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	2.2	3.8	3.5	3.8	5.8	3.3	2.0	2.6	2.6	2.3	3.5	3.2
	2.2	3.6	3.2	3.8	6.2	3.0	2.4	2.6	2.6	2.8	3.6	3.8
	2.2	3.4	3.2	3.8	6.1	3.4	2.4	2.5	2.7	2.8	3.6	3.8
	2.2	2.9	2.8	3.8	6.1	3.4	2.4	2.4	2.7	1.9	3.6	3.8
	2.8	3.4	3.5	3.8	6.2	3.4	2.3	2.3	2.7	1.9	3.6	3.7
	2.2	3.4	3.6	4.0	6.2	3.5	2.2	2.3	2.7	1.8	3.4	3.7
	2.2	3.2	3.4	4.0	5.9	4.8	2.2	2.2	2.6	1.6	3.4	3.5
	2.2	3.0	3.4	3.8	5.5	4.2	1.8	2.1	2.5	2.2	3.2	3.4
	2.2	3.0	3.1	3.8	5.2	3.8	2.1	2.0	2.4	2.2	3.2	3.4
	2.2	3.0	3.1	3.6	8.1	3.5	2.1	2.2	2.5	3.8	3.0	3.2
	2.2	2.8	2.8	3.4	6.5	3.0	2.2	2.2	2.5	4.2	3.0	3.2
	2.2	3.1	2.8	3.3	5.1	3.0	3.4	2.2	2.5	3.5	3.1	3.2
	2.2	3.1	3.0	3.2	4.6	3.0	2.8	2.3	2.4	3.3	3.1	3.2
	2.2	3.1	3.0	3.2	5.1	2.8	2.8	2.3	2.6	2.8	3.1	3.4
	2.2	3.0	3.0	3.8	4.8	2.8	2.5	2.2	2.5	2.8	3.1	3.8
	2.4	3.2	3.0	8.0	4.7	2.6	2.6	2.2	2.0	2.7	3.0	3.6
	2.5	3.4	2.8	10.0	4.6	2.6	2.6	2.2	2.0	2.4	3.3	3.2
	3.0	2.5	3.0	7.6	4.5	2.6	2.6	2.2	2.4	2.4	3.4	3.4
	3.2	3.4	3.2	6.4	3.5	2.6	2.6	2.7	2.4	2.4	3.4	3.4
	3.3	3.4	3.4	6.3	3.5	2.3	2.5	2.4	3.2	2.0	3.4	3.4
	3.3	3.4	3.4	6.3	3.6	2.0	2.4	2.4	3.0	2.8	3.4	3.5
	3.4	3.4	3.4	6.5	3.6	2.3	3.2	2.4	2.6	2.9	3.3	3.6
	3.6	3.4	3.4	6.5	3.6	2.3	2.9	2.5	2.4	3.0	3.2	3.7
	3.8	3.6	3.2	6.0	3.0	2.6	2.9	2.7	2.2	3.0	3.1	3.7
	4.4	3.4	3.1	4.2	3.0	2.9	2.9	2.6	2.8	3.3	3.1	3.6

Daily gage height, in feet, of Piscataquis River near Foxcroft, Me., for 1906—Cont'd.

Day.	Jan	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	4.6	3.1	3.2	4.6	3.2	2.6	2.6	2.5	2.7	4.2	3.3	3.4
27	4.6	3.0	3.4	4.8	3.2	2.6	2.6	3.0	2.8	3.8	3.3	3.4
28	4.2	3.4	3.5	5.6	3.8	2.2	2.6	3.2	2.4	3.7	3.3	3.4
29	4.2	.....	3.8	5.6	3.8	2.2	2.4	2.9	2.2	3.8	3.2	3.4
30	3.8	.....	3.8	5.4	3.8	2.1	2.6	2.8	1.7	3.4	3.2	3.4
31	3.8	.....	4.0	.....	3.5	.....	2.6	2.7	.....	3.4	.....	3.4

NOTE.—River frozen over through February and probably through January. Gage heights are to water surface in hole cut in ice. River open on April 7. The following thicknesses of ice were obtained: February 17, 1.4; February 24, 1.1; March 3, 1.2; March 10, 1.0; March 17, 1.5; March 24, 1.7; March 31, 1.4.

Rating table for Piscataquis River near Foxcroft, Me., for 1904–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	24	2.90	374	4.20	1,403	6.00	3,970
1.70	31	3.00	437	4.30	1,508	6.20	4,335
1.80	40	3.10	502	4.40	1,615	6.40	4,705
1.90	51	3.20	569	4.50	1,725	6.60	5,080
2.00	64	3.30	638	4.60	1,840	6.80	5,460
2.10	81	3.40	709	4.70	1,960	7.00	5,840
2.20	100	3.50	782	4.80	2,085	7.20	6,230
2.30	123	3.60	858	4.90	2,215	7.40	6,620
2.40	148	3.70	938	5.00	2,350	7.60	7,010
2.50	180	3.80	1,023	5.20	2,635	7.80	7,410
2.60	220	3.90	1,113	5.40	2,940	8.00	7,810
2.70	267	4.00	1,208	5.60	3,265	9.00	9,860
2.80	318	4.10	1,303	5.80	3,610	10.00	11,960

NOTE.—The above table is applicable only for open-channel conditions. It is based on 24 discharge measurements made during 1902–1906 and is well defined below gage heights 6.0 feet.

Monthly discharge of Piscataquis River near Foxcroft, Me., for 1906.

[Drainage area, 280 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (16-30)	12,000	1,400	4,610	16.46	9.15
May	8,020	437	2,320	8.29	9.55
June	2,080	64	461	1.65	1.84
July	709	40	220	.786	.91
August	569	64	185	.661	.76
September	569	31	207	.739	.82
October	1,400	24	464	1.66	1.91
November	858	437	628	2.24	2.50
December	1,020	569	776	2.77	3.19

NOTE.—Values are rated as follows: April, good; May to December, excellent.

COLD STREAM AT ENFIELD, ME.

This station was established June 14, 1904, and was located at the highway bridge about three-fourths mile south of Enfield on the road to Passadumkeag. On September 12, 1904, to avoid backwater effects from Passadumkeag stream the gage was taken from the highway bridge and placed about 200 feet below the old mill near Enfield post-office. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 46, where are given also references to publications that contain data for previous years.

Discharge measurements of Cold Stream at Enfield, Me., in 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
mber 9...	H. K. Barrows	.....	17	2.72	36
ber 12.....	F. E. Pressey	.....	20	2.75	37
ber 21.....	.....do	.....	23	2.92	56
mber 4...	.....do	.....	25	2.90	54
1905.					
28.....	F. E. Pressy	33	19.7	2.68	22.6
3.....	.....do	41	44	3.33	168
3.....	.....do	33	19.3	2.63	29.3
26.....	.....do	32	23	2.78	52
26.....	.....do	28	18.2	2.78	55
26.....	.....do	16.5	22	2.78	42
24.....	.....do	32	23	2.80	52
ber 23.....	.....do	30	14.1	2.68	21.3
mber 28..	.....do	34	12.4	2.64	15.9
1906.					
uary 24...	F. E. Pressy	34	11.3	2.66	17
13.....	.....do	35	26	3.04	77
30.....	.....do	36	27	3.10	83

Daily gage height, in feet, of Cold Stream at Enfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.6	2.7	2.6	2.8	3.1	3.2	3.0	2.8	2.7	2.8	2.6	2.6
.....	2.4	2.7	2.7	2.8	3.1	3.2	3.0	2.8	2.7	2.8	2.6	2.6
.....	2.6	2.6	2.7	2.8	3.1	3.1	3.0	2.8	2.7	2.9	2.6	2.6
.....	2.6	2.6	2.7	2.8	3.1	3.1	3.1	2.8	2.8	2.8	2.6	2.6
.....	2.6	2.6	2.6	2.7	3.2	3.2	3.1	2.9	2.8	2.8	2.6	[a] 4.0
.....	2.5	2.6	2.6	2.9	3.2	3.2	3.1	2.9	2.7	2.7	2.7	[a] 2.9
.....	2.6	2.6	2.7	2.9	3.2	3.2	3.0	2.9	2.7	2.7	2.7	2.7
.....	2.6	2.5	2.7	3.0	3.2	3.2	3.0	2.8	2.7	2.7	2.7	2.7
.....	2.6	2.7	2.7	2.9	3.1	3.2	3.0	2.8	2.7	2.7	2.7	2.6
.....	2.6	2.7	2.7	3.0	3.1	3.4	3.0	2.8	2.7	2.8	2.7	2.6
.....	2.6	2.7	2.6	2.9	3.0	3.9	3.0	2.8	2.7	2.7	2.6	2.7
.....	2.7	2.7	2.6	2.9	3.0	3.8	3.0	2.8	2.7	2.7	2.6	2.7
.....	2.7	2.6	2.6	3.3	3.1	3.8	3.0	2.8	2.7	2.7	2.7	2.6
.....	2.7	2.7	2.6	3.0	3.1	3.8	3.0	2.8	2.7	2.7	2.7	2.7
.....	2.7	2.7	2.5	3.0	3.1	3.7	3.0	2.8	2.7	2.7	2.7	2.7
.....	2.6	2.7	2.5	3.0	3.2	3.6	3.1	2.7	2.7	2.6	2.7	2.7
.....	2.7	2.7	2.5	3.3	3.3	3.7	3.1	2.7	2.8	2.8	2.7	2.7
.....	2.7	2.7	2.7	3.1	3.3	3.7	3.0	2.7	2.7	2.8	2.7	2.7
.....	2.6	2.7	2.7	2.9	3.4	3.6	3.0	2.7	2.7	2.8	2.7	2.6
.....	2.6	2.7	2.7	2.9	3.4	3.6	3.0	2.8	2.8	2.7	2.7	2.6
.....	2.7	2.6	2.7	2.9	3.4	3.4	3.0	2.8	2.7	2.7	2.8	2.6
.....	2.7	2.7	2.5	2.9	3.3	3.1	3.0	2.8	2.8	2.6	2.8	2.8
.....	2.7	2.7	2.6	3.3	3.3	3.0	3.0	2.8	2.8	2.6	2.8	2.8
.....	2.6	2.7	2.7	3.3	3.2	3.0	2.9	2.8	2.8	2.7	2.8	2.8
.....	2.6	2.7	2.7	3.3	3.2	3.1	2.9	2.8	2.8	2.7	2.7	2.7
.....	2.7	2.7	2.7	3.1	3.2	3.1	2.9	2.8	2.8	2.6	2.7	2.7
.....	2.7	2.6	2.6	3.1	3.2	3.1	2.9	2.8	2.8	2.7	2.7	2.6
.....	2.6	2.6	2.6	3.1	3.2	3.2	2.8	2.7	2.8	2.8	2.7	2.6
.....	2.6	2.6	2.8	3.1	3.2	3.2	2.8	2.7	2.8	2.7	2.7	2.7
.....	2.6	.....	2.7	3.1	3.2	3.1	2.8	2.8	2.8	2.7	2.6	2.7
.....	2.6	.....	2.7	.....	3.1	.....	2.8	2.8	.....	.....	.....	2.8

[a] Backwater from anchor ice on riffles below station.

E.—Ice does not usually form at this station. It sometimes forms to a thickness of 0.2 foot during ght but invariably goes out during the day. The following thicknesses of ice were obtained: ruary 3, 2 inches; February 15, 2 inches; March 12, 2 inches; March 13, 1 inch; March 23, 2 inches.

Rating table for Cold Stream at Enfield, Me., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.40	2	2.90	52	3.40	153	3.90	316
2.50	6	3.00	69	3.50	186	4.00	353
2.60	12	3.10	88	3.60	216		
2.70	24	3.20	109	3.70	248		
2.80	37	3.30	132	3.80	281		

NOTE.—The above table is applicable only for open-channel conditions. It is based on eight discharge measurements made during 1904–1906 and is fairly well defined between gage heights 2.6 feet and 3.2 feet. Below gage height 2.6 feet it is very uncertain.

Monthly discharge of Cold Stream at Enfield, Me., for 1904–1906.

[Drainage area, 26 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
September (10-30)	69	2	30.9	1.53	1.[illegible]
October	69	6	53.2	2.05	2.[illegible]
November	69	12	33.5	1.29	1.[illegible]
December	37	12	22.6	.869	1.[illegible]
1905.					
January	52	12	22.8	.877	1.[illegible]
February	37	12	24.1	.927	.[illegible]
March	37	12	26.3	1.01	1.[illegible]
April	248	12	42.2	1.62	1.[illegible]
May	316	12	66.5	2.56	2.[illegible]
June	52	24	35.9	1.38	1.[illegible]
July	52	12	36.1	1.39	1.[illegible]
August	24	2	6.65	.256	.[illegible]
September	37	6	27.3	1.05	1.[illegible]
October	24	12	19.0	.731	.[illegible]
November	24	12	17.6	.677	.[illegible]
December [a]	24	10	13.7	.527	.[illegible]
The year	316	2	28.2	1.08	14.[illegible]
1906.					
January	24	2	15.7	.604	.[illegible]
February	24	6	19.5	.750	.[illegible]
March	37	6	11.8	.454	.[illegible]
April	132	24	72.4	2.78	3.[illegible]
May	158	69	107	4.12	4.[illegible]
June	316	69	153	5.88	6.[illegible]
July	88	37	65.7	2.53	2.[illegible]
August	52	24	35.9	1.38	1.[illegible]
September	37	24	29.6	1.14	1.[illegible]
October	52	12	26.9	1.03	1.[illegible]
November	37	12	22.5	.865	.[illegible]
December [b]	37	12	20.6	.792	.[illegible]
The year	316	2	48.4	1.86	25.[illegible]

[a] River frozen December 11 to 13, 1905; discharge estimated 10 second-feet.
[b] Backwater December 5 and 6; discharge corrected.

NOTE.—Values 1904 to 1906, approximate, owing to local changes in control which could not be covered by meter measurements.

PHILLIPS LAKE AND OUTLETS IN HOLDEN AND DEDHAM, ME.

The United States Geological Survey maintains gages at the two outlets of Phillips Lake; also a gage for obtaining a record of lake level. The station at the northern outlet was established July 7, 1904. It is located about 1¼ miles from the lake, one-fourth mile south of the village of East Holden, and 175 feet south of an old mill.

station at the southeastern outlet was established July 19, 1904. located at the highway bridge about 1½ miles southeast of Lake se railroad station, and is about 700 feet southeast of the Maine ral Railroad crossing. The station on Phillips Lake was estab- d July 19, 1904. It is located about one-fourth mile west of Lake se railroad station. The conditions at these stations and the h marks are described in Water-Supply Paper No. 165, page 48, e are given also references to publications that contain data for ious years.

arge measurements of Phillips Lake, northern outlet at East Holden, Me., in 1904–6.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
)....	H. K. Barrows	.....	7.86	1.55	9.66
t 18....	F. E. Pressey	.....	6.54	1.45	6.29
er 17....	do	.....	4.36	1.46	5.64
905.					
7....	F. E. Pressey	15.5	9.9	1.84	24.2
9 [a]....	do	17.0	11.1	1.90	27.2
; [a]....	do	17.0	12.2	1.90	30.7
7....	Pressey and Adams	12.5	11.5	1.82	21.5
t 11....	F. E. Pressey	12.5	9.2	1.77	15.0
t 15....	Barrows and Pressey	9.3	8.6	1.67	11.0
nber 2...	F. E. Pressey	9.5	9.3	1.74	12.6
er 21....	do	5.7	3.0	1.41	1.8
906.					
ary 23...	F. E. Pressey	18	16.6	2.38	59
5....	do	14	12.3	2.34	46
4....	do	14	13.1	2.34	44
7....	do	14	12.9	2.28	40
.....	do	16	17.8	2.52	52
t 24....	Barrows and Pressey	11	14.4	1.85	17.2

[a] From log across stream 100 feet below gage.

arge measurements of Phillips Lake, southeastern outlet near Lake House railroad station, Me., in 1904–06.

ate.	Hydrographer.	Width.	Area of section.	Gage height.		Dis-charge.
				Outlet.	Phillips Lake.	
904.		*Feet.*	*Sq. ft.*	*Feet.*	*Feet.*	*Sec.-ft.*
)....	H. K. Barrows	.....	1.23	1.42	7.05	1.09
t 18....	F. E. Pressey	.....	.20	1.14	6.40	.07
er 17....	do	.....	1.25	1.49	7.34	1.48
905.						
17....	F. E. Pressey	8.0	19.3	2.80	9.40	42.7
9....	do	8.0	15.4	2.28	8.94	12.2
5....	do	8.0	14.3	2.20	8.97	11.9
7....	Pressey and Adams	4.0	1.8	1.62	8.48	3.3
t 11....	F. E. Pressey	2.5	1.19	1.38	7.37	1.25
t 15....	Barrows and Pressey	2.5	1.06	1.35	7.20	1.04
nber 2...	F. E. Pressey	.5	.08	1.06	6.40	.05
er 31....	do	.35	.05	1.10	6.00	.03
906.						
ary 23...	F. E. Pressey	3	1.26	1.50	7.55	1.69
5....	do	3	1.17	1.94	7.25	1.21
7....	do	8	18.2	2.90	9.35	44.2
.....	do	12	10.2	2.20	8.80	13.5
t 24....	Barrows and Pressey	3	.60	1.15	6.05	.01

Daily gage height, in feet, of Phillips Lake, northern outlet, at East Holden, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	2.3	2.4	2.4	2.5	2.5	1.8	1.65	1.8	1.55	1.9	1.7
2	2.0	2.3	2.45	2.45	2.2	2.35	2.45	1.65	1.8	1.55	2.1	1.7
3	2.3	2.5	2.4	2.4	2.5	2.0	1.8	1.65	1.8	1.55	2.3	1.8
4	1.85	2.2	2.5	2.15	2.2	2.45	2.3	1.65	1.8	1.55	2.3	1.8
5	1.85	2.2	2.35	1.8	2.2	2.4	2.3	1.65	1.8	1.55	2.3	1.8
6	1.85	2.2	2.3	2.45	2.2	2.5	2.35	1.65	1.75	1.55	2.3	1.8
7	2.0	2.1	2.05	2.5	2.5	2.55	2.2	1.65	1.7	1.55	2.3	1.8
8	2.2	2.05	2.05	1.8	2.3	2.3	1.8	1.65	1.7	1.55	2.4	1.7
9	1.85	2.05	2.3	2.3	2.25	2.0	1.7	1.65	1.65	1.55	2.4	1.7
10	2.6	2.05	2.4	2.35	2.5	2.0	1.7	1.65	1.6	1.55	2.4	1.7
11	2.0	2.0	2.5	2.3	2.4	2.4	1.8	1.7	1.6	1.55	1.9	1.7
12	1.9	2.0	2.45	2.3	2.2	2.3	1.7	1.65	1.6	1.55	2.4	1.7
13	1.8	2.05	2.4	2.4	2.2	2.4	1.7	1.65	1.6	1.55	2.4	1.7
14	1.8	2.5	2.5	2.3	2.25	2.25	1.7	1.65	1.6	1.55	2.4	1.7
15	1.8	2.5	2.45	2.15	2.45	2.4	1.7	1.65	1.6	1.6	2.4	1.7
16	2.2	2.2	2.3	2.55	2.3	2.4	1.7	1.65	1.6	1.55	2.25	1.7
17	2.3	2.5	2.3	2.32	2.05	2.0	1.7	1.65	1.6	1.55	2.4	1.7
18	2.1	2.3	2.3	2.38	2.05	2.3	1.7	1.7	1.6	1.55	1.9	1.7
19	2.1	2.35	2.3	2.38	2.05	2.4	1.7	1.9	1.6	1.55	2.5	1.7
20	2.1	2.5	2.25	2.42	2.0	2.35	1.7	1.9	1.6	1.55	2.5	1.7
21	2.1	2.2	2.1	2.42	2.0	2.4	1.7	1.9	1.6	1.55	2.4	1.75
22	2.1	2.5	2.5	2.2	2.05	2.4	1.7	1.9	1.55	1.55	2.4	1.75
23	2.1	2.35	2.3	2.4	2.25	2.45	1.7	1.9	1.55	1.5	2.4	1.75
24	2.55	2.4	2.2	2.15	2.4	1.9	1.7	1.9	1.55	1.45	2.4	1.8
25	2.4	2.2	2.2	2.4	2.5	2.3	1.65	1.9	1.55	1.5	1.9	1.8
26	2.4	2.3	2.3	2.5	2.4	2.4	1.65	1.9	1.55	1.95	1.7	1.8
27	2.5	2.5	2.3	2.3	2.0	2.3	1.65	1.85	1.55	1.95	1.7	1.8
28	2.4	2.5	2.5	2.2	2.05	2.4	1.65	1.85	1.55	1.6	1.7	1.8
29	2.4	.....	2.5	2.2	2.3	2.55	1.65	1.8	1.55	1.75	1.7	1.8
30	2.4	.....	2.5	2.4	2.3	2.15	1.65	1.8	1.55	1.6	1.7	1.8
31	2.4	.....	2.55	.....	2.4	.....	1.65	1.8	.....	1.9	.....	1.8

NOTE.—The outlet does not freeze over near the gage, but during short periods the gage height may be affected by ice conditions downstream.

Daily gage height, in feet, of Phillips Lake near East Holden, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	.....	.....	.....	.....	5.8	.....	.....	5.9
2	.....	.....	.....	.....	.....	9.3	.....	.....	.....	.....	.....	.....
3	.....	8.7	7.1	.....	.....	.....	.....	.....	.....	.....	5.35	.....
4	.....	.....	.....	.....	.....	.....	.....	6.7	.....	.....	.....	.....
5	.....	.....	.....	.....	9.4	.....	.....	.....	.....	.....	.....	.....
6	7.8	.....	.....	.....	.....	.....	.....	.....	.....	5.35	.....	.....
7	.....	.....	.....	6.8	.....	.....	7.2	.....	.....	.....	.....	.....
8	.....	.....	.....	.....	.....	.....	.....	.....	5.7	.....	.....	6.1
9	.....	.....	.....	.....	.....	9.1	.....	.....	.....	.....	.....	.....
10	.....	8.4	7.4	.....	.....	.....	.....	.....	.....	.....	5.3	.....
11	.....	.....	.....	.....	.....	.....	.....	6.6	.....	.....	.....	.....
12	.....	.....	.....	.....	9.4	.....	.....	.....	.....	.....	.....	.....
13	7.9	.....	.....	.....	.....	.....	.....	.....	.....	5.35	.....	.....
14	.....	.....	.....	7.3	.....	.....	7.1	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	.....	.....	5.5	.....	.....	6.1
16	.....	.....	.....	.....	.....	8.6	.....	.....	.....	.....	.....	.....
17	.....	8.1	6.8	.....	.....	.....	.....	.....	.....	.....	5.35	.....
18	.....	.....	.....	.....	.....	.....	.....	6.4	.....	.....	.....	.....
19	.....	.....	.....	.....	9.1	.....	.....	.....	.....	.....	.....	.....
20	8.3	.....	.....	.....	.....	.....	.....	.....	.....	5.3	.....	.....
21	.....	.....	.....	9.2	.....	.....	6.9	.....	.....	.....	.....	.....
22	.....	.....	.....	.....	.....	.....	.....	.....	5.4	.....	.....	6.4
23	.....	7.6	.....	.....	8.8	8.1	.....	.....	.....	.....	.....	.....
24	.....	7.5	6.4	.....	.....	.....	.....	.....	.....	.....	5.7	.....
25	.....	.....	.....	.....	.....	.....	.....	6.2	.....	.....	.....	.....
26	.....	.....	.....	.....	8.7	.....	.....	.....	.....	.....	.....	.....
27	8.8	.....	.....	.....	.....	.....	.....	.....	.....	4.1	.....	.....
28	.....	.....	.....	9.4	.....	.....	6.9	.....	.....	.....	.....	.....
29	.....	.....	.....	.....	.....	.....	.....	.....	5.35	.....	.....	6.8
30	.....	.....	.....	.....	.....	7.6	.....	.....	.....	.....	.....	.....
31	.....	.....	6.4	.....	.....	.....	.....	.....	.....	.....	.....	.....

NOTE.—The lake did not freeze over at the gage during the year.

Rating table for Phillips Lake, northern outlet, at East Holden, Me., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	1.3	1.80	15.8	2.20	36.5	2.50	53
1.50	3.6	1.90	20.5	2.30	42	2.60	59
1.60	7.2	2.00	25.5	2.40	47.5	2.70	65
1.70	11.3	2.10	31				

NOTE.—The above table is applicable only for open-channel conditions. It is based on ten discharge measurements made during 1904–1906, and is fairly well defined.

Rating table for Phillips Lake, southeastern outlet, near Lake House railroad station, Me., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
6.00	0.02	7.00	0.80	8.00	2.4	8.90	13
6.10	.03	7.10	.95	8.10	2.6	9.00	17
6.20	.04	7.20	1.10	8.20	2.9	9.10	23
6.30	.05	7.30	1.25	8.30	3.2	9.20	29
6.40	.07	7.40	1.40	8.40	3.6	9.30	37
6.50	.10	7.50	1.55	8.50	4.2	9.40	46
6.60	.20	7.60	1.70	8.60	5.3	9.50	55
6.70	.35	7.70	1.85	8.70	7.0	9.60	65
6.80	.50	7.80	2.0	8.80	9.5	9.70	75
6.90	.65	7.90	2.2				

NOTE.—The above table is applicable only for open-channel conditions. It is based on sixteen discharge measurements made during 1904–1906, and is fairly well defined. It applies to gage heights of Philips Lake.

Monthly discharge of Phillips Lake outlets, in Holden and Dedham, Me., for 1904–1906.

[Drainage area, 12.3 square miles.]

Month.	Discharge in second-feet.					Run-off.	
	Northern outlet.			Southeastern outlet.		Sec.-ft. per sq. mile.	Depth in inches.
	Maximum.	Minimum.	Mean.	Mean.	Total.		
1904.							
July (7-31)	11.3	3.6	6.11	[a] 0.61	.....	.....	.....
August	11.3	1.3	4.62	[b] .14	.....	.....	.....
September	3.6	1.3	1.71	.....	.....	.....	.....
October	2.4	1.8	2.09	([c])	.....	.....	.....
November	13.5	2.4	4.41	.....	.....	.....	.....
December	25.5	7.2	11.3	([d])	.....	.....	.....
1905.							
January	65.0	7.2	19.2	.....	.....	.....	.....
February	13.6	7.2	10.3	6.44	16.7	1.36	1.42
March	42	3.6	10.3	8.38	18.7	1.52	1.75
April	36.5	15.8	21.8	5.01	71.9	5.85	6.53
May	28.2	18.2	22.6	1.46	37.2	3.02	3.48
June	25.5	18.2	20.2	4.59	24.8	2.02	2.25
July	20.5	3.6	7.36	2.18	9.54	.776	.89
August	20.5	5.4	14.1	1.04	15.1	1.23	1.42
September	15.8	1.3	4.03	.069	4.10	.333	.37
October	15.8	1.3	2.98	.036	3.02	.246	.28
November	11.3	1.3	4.05	.044	4.09	.333	.37
December	42.0	3.6	14.9	1.52	16.4	1.33	1.53
The year	65.0	1.3	12.7	.....	.....	.....	.....

[a] July 19–31. [b] August 1–22. [c] Discharge October 17, 1.31 sec.-ft. [d] Discharge December 6, 3.2 sec.-ft.

Monthly discharge of Phillips Lake outlets, in Holden and Dedham, Me., for 1904-1906—Continued.

Month.	Discharge in second-feet.					Run-off.	
	Northern outlet.			Southeastern outlet.		Sec.-ft. per sq. mile.	Depth in inches.
	Maximum.	Minimum.	Mean.	Mean.	Total.		
1906.							
January	50.0	15.8	33.2	4.22	37.4	3.04	[illegible]
February	53.0	25.5	40.8	3.70	44.5	3.62	[illegible]
March	56.0	28.2	44.8	.60	45.4	3.69	[illegible]
April	56.0	15.8	42.6	19.2	61.8	5.02	[illegible]
May	53.0	25.5	39.6	30.8	70.4	5.72	[illegible]
June	56.0	20.5	43.0	13.9	56.9	4.63	[illegible]
July	50.2	9.2	16.8	.84	17.6	1.43	[illegible]
August	20.5	9.2	13.5	.16	13.7	1.11	[illegible]
September	15.8	5.4	8.65	0	8.65	.703	[illegible]
October	23.0	2.4	7.25	0	7.25	.589	[illegible]
November	53.0	11.3	36.5	0	36.5	2.97	[illegible]
December	15.8	11.3	13.4	.13	13.5	1.10	[illegible]
The year	50.0	2.4	28.3	6.13	34.5	2.80	[illegible]

NOTE. Above values for both stations, 1904-6, are approximate, owing to local changes in conditions of flow, which could not be covered by meter measurements.

KENNEBEC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kennebec River is one of the best streams in the United States for the development of water power. Its basin, which lies wholly within the State of Maine, between those of the Androscoggin and the Penobscot, is 150 miles in length and from 50 to 80 miles in width in the main portion, embracing a total area of 5,970 square miles. Of this area, 1,240 square miles are tributary to Moosehead Lake, in which the river has its source. The upper tributaries, however, rise in the hilly forested areas lying to the east and west of that lake. Of these, Moose River is the most important.

Below the outlet of Moosehead Lake the hills close in on the river, forming a narrow rocky chasm, with steep and precipitous sides. From Moosehead Lake to the upper end of Indian Pond, a distance of about 4.5 miles, there is a fall of about 90 feet, this being a very rough, rocky, and turbulent part of the river. Indian Pond is a stretch of quiet water about 5 miles long, with a maximum width of one-half mile. From Indian Pond to the Forks the river is a torrent, falling in a rough and rocky bed about 350 feet in a distance of about 15 miles. Dead River is tributary to the Kennebec at the Forks. Below this junction the river flows with a lesser slope in a narrow winding bed about 20 miles to Bingham; thence through a broader valley, in which are located many farms. Between Bingham and tide water there are a number of large falls, at which water power has been developed.

For a detailed report on Kennebec River drainage, including all data available up to December, 1906, see Water-Supply Paper No. 198.

RIVER SURVEYS IN KENNEBEC DRAINAGE.

In order to point out the power and storage possibilities in the Kennebec River drainage basin, surveys have been made as follows

From tide water to Moosehead Lake, for the determination of the profile and plan of the river.

Moose River from Moosehead Lake to near Long Pond.

Surveys of Wood and Attean ponds and Brassua Lake, to determine their storage capacity.

Surveys of Holeb, Long, Lower and Middle Roach, West Carry, and Spencer ponds, and Flagstaff and Spring lakes, to determine their areas.

From the data collected by the river surveys sheets have been prepared, showing as far as available the profile of water surface, plan of the river, contours along the banks, and prominent natural or artificial features.

From the lake surveys sheets have been prepared, showing as far as possible the shore lines and bank contours, covering from 10 to 20 feet depth of storage.

The results of these surveys have been published on sheets, and may be had on application to the Director of the Geological Survey.

MOOSEHEAD LAKE AT EAST OUTLET, MAINE.

A record of gage heights of Moosehead Lake level at Moosehead Lake east outlet has been kept since April, 1895, by the Hollingsworth & Whitney Company, supplemented for a portion of this time by gage readings at Greenville, furnished for publication by this company.

These gages are cast-iron staff gages set to the same datum; that at Moosehead Lake east outlet is referred to the following bench mark: Copper bolt set in a large rock near left end of dam at elevation 18.428 of gage datum, zero of gage datum being approximately 10 feet below the gate sills and 1,011.30 feet above mean sea level. Gage readings in the following list are referred to a datum 10 feet higher, i. e., with zero at sill of gates. For gage heights previous to 1906 see Water-Supply Paper No. 198.

Daily gage height, in feet, of Moosehead Lake at East Outlet and at Greenville, Me., for 1906.

Day.	January.	February.	March.	April.	May.		June.	
	East outlet.	East outlet.	East outlet.	East outlet.	East outlet.	Greenville.	East outlet.	Greenville.
1						3.0	7.46	7.6
2	0.5	0.5		0.9	3.3	3.15		7.6
3			0.8					
4	.5			.95	3.75	4.4	7.45	7.4
5	.45	.45	.7			3.85		7.6
6				.95			7.42	7.5
7		.4	.7		4.58			7.5
8						4.6	7.4	7.4
9		.35	.7	1.0	5.05	4.9		7.4
10	.4					5.35		
11				1.0	5.9	5.75	7.4	7.5
12		.3	.7			6.0		7.5
13	.35		.75				7.4	7.5
14		.5			5.95	6.55		7.4
15	.4					6.85	7.35	7.4
16		.6	.8		7.15	7.1		7.35
17	.3			1.1		7.2		
18				1.2	7.32	7.35	7.25	7.3
19	.3	.7				7.4		7.25
20			.86				7.1	7.3
21		.7	.9			7.5		7.1
22	.25						7.0	7.1
23				1.8	7.5	7.5		7.0
24	.25		.9			7.5		
25				2.05		7.55	7.1	7.0
26	.5		.9			7.55		7.15
27		.8		2.4		7.4	7.05	7.15
28		.8	.8		7.5			7.1
29	.45					7.55	6.95	7.0
30			.8	2.88	7.45	7.6		7.0
31	.5					7.5		

Day.	July.		August.		September.		October.		November.		December.	
	East outlet.	Greenville.	East outlet.	Greenville.	East outlet	Greenville.	East outlet.	Greenville.	East outlet.	Greenville.	East outlet.	Greenville.
1	6.85		4.9	4.95		3.2		2.0		2.4		
2	6.7			4.95				2.0	2.8	2.5		
3		6.7	4.8	4.9	3.1	3.1	2.05	2.0		2.5	3.25	
4	6.55	6.55		4.8		3.1		2.0				
5		6.6			2.95	3.1	2.0	1.9	2.85	2.8		
6	6.35	6.5	4.65	4.65		3.0		1.8		2.8	3.3	3.3
7		6.35		4.65	2.85	3.0			2.9	2.9	3.3	3.3
8			4.5	4.65		3.0	1.9	1.9		2.9		
9	6.15			4.5				1.6	3.0	2.9		
10		6.1	4.35		2.75	2.9	2.1	1.9		2.9		
11	6.0	6.1		4.25		2.8		1.9				
12		6.0			2.75	2.8	2.15	1.9	3.0	2.9	3.25	
13	5.9	5.95	4.1	4.25		2.8		2.1		2.9		
14		5.9		4.2	2.50	2.8			2.9	2.9	3.2	
15			3.95	4.15		2.8	2.2			2.9		
16	5.7	5.75		4.0				2.2	3.0	2.9		
17		5.6	3.85	3.9	2.45	2.5	2.2	2.2		2.9	3.2	
18	5.6	5.7		3.85		2.5		2.2				
19		5.6			2.4	2.5	2.15	2.2	3.05	3.0	3.2	
20	5.5	5.55	3.75	3.75		2.5		2.2		3.0		
21		5.5		3.7	2.4	2.4			3.0	3.1	3.2	
22				3.65		2.2	2.10	2.2		3.0		
23	5.4	5.4		3.65				2.2	3.2	3.2		
24		5.4	3.6	3.7	2.3		2.2			3.3	3.15	
25	5.33	5.4		3.6				2.2				
26		5.35			2.2	2.1	2.5		3.3		3.3	
27	5.2		3.4	3.45		2.1		2.3		3.3		
28		5.2			2.15	2.1			3.3	3.3	3.35	
29			3.3			2.0	2.6	2.5		3.3		
30	5.0	4.45		3.2	2.1			2.4	3.3	3.3		
31		5.05	3.15	3.2			2.8	2.4				

[illegible] ry 1 to May 13 and December 2 to 31.

KENNEBEC RIVER AT THE FORKS, MAINE.

is station was established September 28, 1901, at the wooden vay bridge across Kennebec River at The Forks, above the h of Dead River. Of the drainage area at this station, 1,240 e miles are tributary to Moosehead Lake and the remaining 330 e miles drain into the Kennebec by small streams with steep s and no storage. The conditions at this station and the bench s are described in Water-Supply Paper No. 165, page 53, and in r-Supply Paper No. 198, where are given also references to pub- ons that contain data for previous years. Gage datum, revised g July, 1906, is 565.44 feet above mean sea level. Length of , formerly 17.18 feet, was changed to 17.08 feet May 8, 1906. neasurement was made September 5, 1906, by F. E. Pressey with ollowing results:

th, 124 feet; area, 799 square feet; gage height, 2.70 feet; discharge, 2,200 l-feet.

Daily gage height, in feet, of Kennebec River at The Forks, Maine, for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	.....	.....	.....	.....	3.45	4.8	4.3	3.9	3.3	1.6	1.05	0.8
.....	.....	.....	.....	.....	4.25	5.4	5.0	3.9	3.3	1.7	0.75	0.8
.....	.....	4.7	.....	.....	4.45	5.2	4.8	3.95	3.15	1.7	1.0	1.0
.....	.....	.....	.....	.....	4.45	3.9	4.6	3.25	3.0	1.7	1.45	1.45
.....	.....	.....	.....	.....	4.65	5.0	4.9	3.6	2.75	1.7	1.3	1.8
.....	2.9	.....	.....	.....	4.75	6.05	4.7	3.7	2.7	1.6	1.3	1.85
.....	.....	.....	.....	2.4	4.55	6.2	4.65	3.3	2.7	1.6	1.25	.....
.....	.....	.....	.....	.....	3.8	5.85	4.7	3.1	2.7	1.6	1.3	.....
.....	.....	.....	4.3	.....	3.85	4.9	4.7	3.75	2.7	1.6	1.3	.....
.....	.....	4.7	.....	.....	5.1	4.95	4.9	2.9	1.8	2.25	1.6	.....
.....	.....	.....	.....	.....	6.0	5.0	4.75	2.8	2.6	2.9	1.55	.....
.....	.....	.....	.....	.....	4.0	5.1	4.8	2.8	2.5	3.35	1.6	3.5
.....	1.8	.....	.....	.....	4.05	4.7	4.65	2.75	2.65	2.65	1.6	.....
.....	.....	.....	.....	2.2	4.5	4.35	4.15	2.7	2.6	1.75	1.1	.....
.....	.....	.....	.....	2.3	4.4	4.7	4.1	3.4	2.6	0.9	1.0	.....
.....	.....	.....	4.5	3.9	4.8	4.25	3.95	3.15	2.55	1.1	0.7	.....
.....	.....	5.5	.....	5.15	5.95	3.95	3.65	3.0	2.5	1.2	0.6	.....
.....	.....	.....	.....	5.95	6.9	4.35	3.4	2.95	2.35	1.2	0.6	.....
.....	.....	.....	.....	4.75	6.5	4.65	3.15	2.8	2.3	1.45	0.95	.....
.....	2.7	.....	.....	3.35	6.4	4.65	2.85	2.75	1.65	1.75	0.75	.....
.....	.....	.....	.....	3.25	6.4	4.65	2.75	2.7	1.4	2.0	1.0	3.0
.....	.....	.....	.....	3.4	6.7	4.7	2.75	2.7	1.35	2.2	1.4	.....
.....	.....	.....	.....	3.45	5.9	4.65	2.7	2.85	1.4	2.2	1.45	.....
.....	.....	4.6	4.5	3.3	6.75	3.8	2.55	2.9	1.4	2.3	1.4	.....
.....	.....	.....	.....	3.0	6.4	1.9	3.1	2.8	1.4	2.55	0.85	.....
.....	.....	.....	.....	3.0	5.6	2.15	3.8	2.8	1.4	2.85	0.7	.....
.....	.....	.....	.....	2.75	6.05	4.95	3.4	2.8	1.4	2.25	0.7	.....
.....	4.6	.....	.....	2.7	6.2	4.6	3.4	3.35	1.4	2.0	0.7	.....
.....	.....	.....	.....	2.7	5.95	4.5	3.7	3.5	1.4	1.9	0.8	2.8
.....	.....	.....	.....	3.15	4.95	3.75	3.9	3.4	1.4	1.5	0.8	.....
.....	.....	.....	2.9	.....	5.35	.....	3.9	3.4	.....	1.25	.....	.....

.—The following ice conditions prevailed during 1906: River frozen January 1 to April 19 and ber 7 to 31, inclusive; the ice went out April 20. During the frozen period gage heights were o water surface through a hole in the ice.
ollowing comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 6	2.9	2.9	0.9	February 28	4.28	4.3	1.9
January 13	1.8	1.6	1.2	March 9	4.3	4.3	2.1
January 20	2.7	2.6	1.5	March 24	4.5	4.4	2.3
January 28 [a]	4.6	4.6	.....	April 7 [b]	2.4	1.8	.....
February 3 [a]	4.7	4.7	1.5	April 14 [c]	2.2	2.2	.....
February 10 [a]	4.7	4.7	1.7	December 12	3.5	3.2	.4
February 17 [a]	5.5	5.5	1.5	December 21	3.0	.....	.9
February 24	4.6	4.6	1.9	December 29	2.8	2.8	1.0

[a] Ice jam 1 mile long extended above and below the station January 28 to February 17.
[b] Water over top of ice; ice settled and not safe.
[c] Ice not safe.

From April to August considerable fluctuations in gage heights occur daily, due to the regulating of the flow at Indian Pond dam for the purpose of log driving. The gage heights from April 23 to August 9, inclusive, are the mean of four readings daily.

Rating table for Kennebec River at The Forks, Me., for 1901 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.60	340	1.90	1,220	3.20	2,775	5.00	6,525
.70	390	2.00	1,305	3.30	2,935	5.20	7,050
.80	445	2.10	1,395	3.40	3,100	5.40	7,590
.90	505	2.20	1,490	3.50	3,270	5.60	8,145
1.00	565	2.30	1,590	3.60	3,450	5.80	8,720
1.10	630	2.40	1,700	3.70	3,635	6.00	9,315
1.20	695	2.50	1,815	3.80	3,825	6.20	9,930
1.30	765	2.60	1,935	3.90	4,020	6.40	10,550
1.40	835	2.70	2,060	4.00	4,220	6.60	11,190
1.50	910	2.80	2,190	4.20	4,635	6.80	11,850
1.60	985	2.90	2,325	4.40	5,070	7.00	12,520
1.70	1,060	3.00	2,470	4.60	5,535		
1.80	1,140	3.10	2,620	4.80	6,020		

NOTE.—The above table is applicable only for open-channel conditions. It is based on fourteen discharge measurements made during 1901-6, and is well defined between gage heights 1.1 feet and 5.5 feet. Above gage height 5 feet it is based on an extension of the curves of area and mean velocity, the latter determined with the aid of Kutter's formula.

Monthly discharge of Kennebec River at The Forks, Me., for 1906.

[Drainage area, 1,570 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (21-30)	3,180	2,060	2,640	1.68	0.6[illegible]
May	12,200	3,180	7,440	4.74	5.4[illegible]
June	9,930	1,220	5,720	3.64	4.0[illegible]
July	6,520	1,880	4,300	2.74	3.[illegible]
August	4,120	2,060	2,740	1.75	2.0[illegible]
September	2,940	800	1,610	1.03	1.1[illegible]
October	3,020	505	1,270	.808	.9[illegible]
November	985	340	633	.403	.4[illegible]

NOTE. Values are rated as excellent, except during the log-driving season, when they should be classed as good.

KENNEBEC RIVER NEAR NORTH ANSON, ME.

This station was established October 18, 1901. It is located 1½ miles east of North Anson and about 1 mile above the mouth of Carrabassett River. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 56, and in Water-Supply Paper No. 198, where are given also data for previous years.

Numerous measurements under ice cover have been made at this station at a section some 500 feet below the bridge, and a rating curve constructed for such conditions. For further details of winter measurements at this point and of rating curve used see Water-Supply Paper No. 187.

Considerable fluctuations in the gage heights at this station occur from about May 1 to July 31, as at The Forks, but in less marked degree, due to regulation of the flow at Indian Pond dam for log-driving purposes. The discharge during this period is a mean of the discharges corresponding to gage heights of the high and low daily periods, considering each period as lasting twelve hours.

Gage readings were made twice each day by Mrs. C. S. Benjamin, the toll collector at the bridge, until July 1; after that time by H. C. Stetson. The length of the chain was 30.13 feet January 9, 1906. The gage datum is 243.83 feet above mean sea level, as determined by the Kennebec River survey of 1904, and readjusted in 1906. The datum of the three gages is the same. The reference point is a marked point on the bottom chord of the bridge near the chain gage; elevation, 24.81 feet January 9, 1906. Elevations refer to the datum of the gage. The reference point, and hence the bridge at that point, has settled about 0.3 foot in eighteen months. The gage has been corrected several times by level during this time, however, and it is believed that no error of consequence in gage readings has resulted.

Discharge measurements of Kennebec River near North Anson, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.[a]	Gage height.[b]	Thickness of ice.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Feet.*	*Feet.*	*Sec.-ft.*
January 9	Pressey and Adams	440	1,100	3.58	3.66	1.28	1,290
January 10	do	440	1,030	3.40	3.52	1.30	1,120
March 2	F. E. Pressey	445	1,140	4.26	4.40	1.97	1,590
March 3	do	445	1,050	4.08	4.25	1.98	1,380
March 30	do	447	1,180	4.77	4.93	2.26	1,600
March 30	do	447	1,200	4.80	4.96	2.26	1,660
April 11	do	450	1,210	4.70	4.75	1.95	1,660
April 11	do	450	1,240	4.70	4.75	1.95	1,710
May 10	do	325	3,000	7.06	.....	.....	11,700

[a] To water surface. [b] To top of ice.

Daily gage height, in feet, of Kennebec River near North Anson, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	.....	.....	.....	6.3	5.9	4.1	3.4	3.7	2.55	3.15	2.35
2	.....	.....	2.4	.....	7.1	5.85	4.3	3.45	3.6	2.5	2.95	3.95
3	.....	2.3	2.3	2.4	7.75	6.8	4.5	3.35	3.45	2.4	2.75	.....
4	.....	.....	.....	.....	8.25	5.1	4.35	3.45	3.5	2.35	3.0	.....
5	.....	.....	.....	.....	7.4	5.0	4.2	3.35	3.4	2.3	3.05	3.85
6	.....	.....	.....	.....	8.0	5.25	3.95	3.05	3.3	2.35	2.95	3.8
7	.....	.....	.....	2.7	7.5	6.75	4.2	3.0	3.3	2.45	2.75	3.7
8	2.5	.....	2.2	.....	6.8	7.45	4.35	2.95	3.25	2.5	2.75	3.65
9	2.4	.....	.....	.....	6.4	7.1	4.4	2.95	3.25	2.5	2.75	3.45
10	2.2	2.2	.....	.....	7.25	6.2	4.15	3.65	3.25	4.45	2.9	.....

Daily gage height, in feet, of Kennebec River near North Anson, Me., for 1906—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11				2.8	9.2	6.15	3.45	3.25	3.2	4.5	2.85	.....
12					7.7	5.75	4.7	3.2	3.15	4.25	2.9	3.5
13			2.2		6.75	5.15	4.7	3.25	3.15	3.55	3.0	.....
14	2.5			2.8	6.8	5.15	4.65	3.2	3.1	3.1	2.7	.....
15					7.0	4.75	4.25	3.45	2.95	2.7	2.6	.....
16					6.5	5.0	3.9	3.45	2.85	2.65	2.4	2.7
17	2.5	2.1	2.3		6.8	4.0	3.65	3.35	2.85	2.35	2.4	.....
18				10.0	7.7	4.1	3.9	3.3	2.85	2.5	2.05	.....
19				9.5	8.05	4.15	3.8	3.25	2.85	2.5	2.2	.....
20	1.9		2.0	8.05	7.35	4.5	3.85	3.2	2.85	2.6	2.45	.....
21				6.85	7.55	4.0	3.8	3.2	2.75	3.1	2.7	.....
22				7.2	7.35	4.05	4.15	3.15	2.65	3.3	2.85	.....
23				7.85	6.35	4.05	4.3	3.15	2.5	3.35	2.85	2.9
24		2.5	2.2	7.2	6.9	4.4	4.3	3.15	2.65	3.65	2.8	.....
25				6.15	6.2	3.25	4.7	3.35	2.6	3.8	2.65	.....
26				5.85	6.5	3.4	4.25	3.15	2.55	4.9	2.55	.....
27	3.9		2.2	4.5	6.05	4.6	4.15	3.35	2.5	4.75	2.55	.....
28				5.25	7.8	4.6	3.4	3.7	2.5	4.4	2.4	.....
29			2.6	5.35	6.95	4.3	3.3	3.95	2.5	4.1	2.25	.....
30			2.7	5.55	7.35	4.3	3.15	3.95	2.45	3.75	2.3	2.8
31					6.95		3.35	3.75		3.25		.....

NOTE.—River frozen January 1 to April 17, and December 3 to 31, inclusive; clear of ice April 18. During the frozen period gage heights are to the bottom of ice.

Thickness of ice was measured as follows:

Thickness of ice.

Date.	Thickness of ice.	Date.	Thickness of ice.	Date.	Thickness of ice.
	Feet.		*Feet.*		*Feet.*
January 1	0.9	February 17	1.9	December 5	0.4
January 8	1.0	February 24	1.8	December 6	.6
January 9	1.3	March 2, 4, 8, 13	2.0	December 7	.7
January 10	1.4	March 17, 20	2.1	December 8	.8
January 14	1.1	March 24, 27, 29, 30	2.3	December 9	1.0
January 17	1.1	April 3, 7	2.1	December 12	1.2
January 20	1.2	April 11	2.0	December 16, 23	1.4
January 27	1.3	April 14	1.9	December 30	1.5
February 3, 10	1.5				

Backwater due to anchor ice reported December 2, and probably continued throughout the month.

Rating table for Kennebec River near North Anson, Me.

OPEN-CHANNEL CONDITIONS, 1904 TO 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.40	1,544	3.80	3,958	5.20	7,316	7.20	13,200
2.50	1,680	3.90	4,169	5.30	7,587	7.40	13,880
2.60	1,822	4.00	4,385	5.40	7,858	7.60	14,580
2.70	1,970	4.10	4,606	5.50	8,136	7.80	15,300
2.80	2,124	4.20	4,832	5.60	8,415	8.00	16,030
2.90	2,284	4.30	5,062	5.70	8,700	8.20	16,780
3.00	2,450	4.40	5,297	5.80	8,984	8.40	17,540
3.10	2,621	4.50	5,536	5.90	9,274	8.60	18,330
3.20	2,797	4.60	5,779	6.00	9,565	8.80	19,130
3.30	2,978	4.70	6,026	6.20	10,130	9.00	19,930
3.40	3,164	4.80	6,277	6.40	10,710	10.00	24,030
3.50	3,355	4.90	6,532	6.60	11,310		
3.60	3,551	5.00	6,790	6.80	11,920		
3.70	3,752	5.10	7,053	7.00	12,550		

[a] This table is applicable only for open-channel conditions. It is based on seven discharge measurements made during 1904–6, and the form of the 1903 curve. It is well defined below gage height 5 feet.

Rating table for Kennebec River near North Anson, Me.—Continued.

UNDER ICE COVER, 1904 TO 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.50	590	2.20	1,170	2.90	1,790	3.60	2,460
1.60	670	2.30	1,255	3.00	1,885	3.70	2,560
1.70	750	2.40	1,340	3.10	1,980	3.80	2,660
1.80	830	2.50	1,430	3.20	2,075	3.90	2,760
1.90	915	2.60	1,520	3.30	2,170		
2.00	1,000	2.70	1,610	3.40	2,265		
2.10	1,085	2.80	1,700	3.50	2,360		

[a] This table is applicable only for ice-cover conditions. It is based on thirteen discharge measurements during 1904–6, and is well defined between gage heights (to bottom of ice) 1.5 feet and 3.4 feet.

Monthly discharge of Kennebec River near North Anson, Me., for 1906.

[Drainage area, 2,790 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	2,760	915	1,680	0.602	0.69
February	1,430	1,080	1,240	.445	.46
March	1,610	1,000	1,220	.437	.50
April	24,000	1,340	7,120	2.55	2.84
May	20,700	9,700	13,200	4.75	5.48
June	14,100	2,887	7,100	2.54	2.83
July	6,026	2,709	4,584	1.64	1.80
August	4,277	2,367	3,057	1.09	1.26
September	3,752	1,612	2,455	.880	.98
October	6,532	1,415	2,982	1.07	1.23
November	2,709	1,131	1,966	.704	.78
December	2,810	1,479	2,032	.728	.84
The year	24,000	915	4,057	1.45	19.80

NOTE.—Values are rated as follows: January to March and December, fair; April to November, good.

KENNEBEC RIVER AT WATERVILLE, ME.

Observations of the flow of Kennebec River at Waterville have been made by Hollingsworth & Whitney Company since 1892, and furnish the longest set of continued records of flow of this river. This company manufactures manila paper, ground wood, and sulphite pulp.

The dam is of timber-crib work, the main portion having a vertical downstream face with a horizontal crest about 5.75 feet wide; the upstream slope is about 40 degrees with the horizontal. The average elevation of crest of dam, as determined by levels during July, 1906, was 119.37 of the Hollingsworth & Whitney datum, which corresponds to 71.53 of mean sea level, according to Kennebec datum, as corrected by levels of 1906. The total length of the dam is 800 feet, which includes a width of log-way of 34 feet. Flashboards are kept on the dam the greater part of the time, their average elevation at the above time being 123.73 of Hollingsworth & Whitney datum, or 75.89 of mean sea level. The crest of the dam is in fairly good condition. The leakage has never been measured, but is assumed as

100 second-feet arbitrarily. The water which flows through the canals is used through 46 wheels, most of which have been rated under practically the same head at Holyoke, the average head at Waterville being about 23 feet. Some water is wasted through the canal, through small waste gates, and over waste weirs. A small amount is used for washing and mill purposes, 100 cubic feet per second being arbitrarily added for these last two items.

Methods and diagrams for estimating the flow through the wheels and over the dam were developed by the late Sumner Hollingsworth, engineer for the company.

Observations are made at 12 o'clock noon of each day, that hour having been chosen after investigation as a time when the flow is least affected by storage of dams upstream and as giving most nearly the average for the day. When the flow of the river is less than about 3,500 second-feet, all of the water is used through the wheels.

The estimates of flow at this point are probably in error from 10 to 15 per cent on account of the manner in which the flow has been computed and the uncertainty of the constants used. During the past four or five years (up to January 1, 1906) the computations are in error from 10 to 15 per cent where flow has been computed with flashboards, owing to the assumption that the top of the boards were at elevation 124 of the Hollingsworth & Whitney datum; the results as published were too small.

These records are now being furnished by the Hollingsworth & Whitney Company, through the courtesy of their engineer, Mr. James L. Dean.

All records and estimates for this station for years prior to 1907 have been revised and republished in Water-Supply Paper No. 198.

Daily discharge, in second-feet, of Kennebec River at Waterville, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,450	3,792	2,310	4,223	20,350	16,920	7,574	5,240	3,035	1,184	3,863	2,634
2	2,339	3,591	2,553	4,470	24,520	14,430	7,288	4,753	3,041	1,794	3,541	1,075
3	2,694	3,187	2,530	4,055	25,210	15,800	7,829	4,552	4,089	2,105	2,702	2,490
4	1,992	1,528	1,244	3,965	26,380	16,380	6,500	4,286	3,667	1,842	2,711	2,214
5	1,981	2,668	2,638	4,310	25,630	14,770	7,557	3,457	3,099	1,770	3,858	1,890
6	1,809	2,624	2,595	6,743	24,980	14,920	7,768	4,630	3,719	1,810	3,278	1,928
7	633	2,016	2,039	7,897	23,770	21,450	7,626	4,219	2,654	873	2,673	1,450
8	2,908	2,006	2,766	6,924	23,100	20,350	7,133	3,657	3,419	1,836	2,662	1,415
9	2,297	1,778	2,018	7,259	20,390	21,030	7,384	3,884	1,812	1,869	2,969	1,834
10	1,346	1,663	1,623	7,296	22,770	18,150	6,939	3,884	3,481	2,154	3,032	2,713
11	1,571	1,228	1,214	6,021	34,370	18,510	7,605	4,186	3,306	9,178	2,118	2,654
12	2,112	1,747	2,550	5,835	27,760	15,520	7,412	2,159	2,999	7,152	3,804	2,727
13	1,932	2,051	2,819	6,311	20,590	19,130	8,801	3,377	1,850	5,317	3,613	2,633
14	902	2,328	2,006	6,977	22,380	14,710	8,122	3,326	3,848	3,645	3,809	2,723
15	1,612	2,068	2,244	17,180	22,020	12,920	7,218	2,993	2,939	3,873	3,272	2,708
16	2,214	2,024	1,795	39,390	18,650	11,260	6,267	3,036	1,195	2,710	3,587	[a]2,700
17	1,643	2,029	1,714	37,080	19,060	10,810	5,285	3,350	2,688	2,402	3,261	2,688
18	3,073	609	906	33,120	21,240	5,326	6,080	3,069	2,299	1,988	2,091	2,439
19	2,553	2,589	2,565	33,010	24,480	6,479	5,928	2,386	2,114	1,863	3,278	2,785
20	2,779	2,656	2,296	32,910	23,670	8,127	5,355	3,761	2,393	2,257	4,066	2,776

[a] Approximate.

Daily discharge, in second-feet, of Kennebec River at Waterville, Me., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	1,487	2,352	1,975	28,860	20,980	7,337	5,303	3,081	2,421	1,815	4,490	2,406
22	2,805	2,569	2,288	31,370	19,980	7,378	4,357	2,783	2,131	3,959	4,490	2,350
23	2,804	2,368	1,988	32,930	18,410	8,803	5,515	3,010	901	3,672	4,734	1,870
24	8,171	2,236	1,952	28,910	17,090	12,630	5,533	3,347	2,088	3,609	4,482	3,880
25	8,208	1,505	938	22,690	14,430	11,280	5,805	3,280	1,788	3,916	3,055	2,444
26	7,833	2,887	2,056	21,210	16,890	8,161	5,286	2,291	2,081	8,360	3,800	4,105
27	6,946	2,851	1,923	18,240	20,720	5,374	4,851	3,401	1,812	8,608	3,837	3,606
28	5,899	2,865	2,465	17,160	25,210	9,272	4,666	3,445	2,071	8,068	3,827	3,543
29	5,917	.....	3,714	19,200	25,890	8,504	3,668	5,220	1,758	7,321	2,375	3,292
30	5,091	.....	4,208	20,340	20,980	7,967	3,815	4,909	588	5,678	3,543	2,125
31	3,560	.....	5,016	.....	19,080	.....	5,113	4,648	.....	5,049	.....	2,998

Monthly discharge of Kennebec River at Waterville, Me., for 1906.

[Drainage area, 4,270 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	8,210	633	3,210	0.752	0.87
February	3,790	609	2,280	.534	.56
March	5,020	906	2,290	.536	.62
April	39,400	3,960	17,200	4.03	4.50
May	34,400	14,400	22,300	5.22	6.02
June	21,400	5,330	12,800	3.00	3.35
July	8,800	3,670	6,310	1.48	1.71
August	5,240	2,160	3,660	.858	.99
September	4,090	588	2,530	.593	.66
October	9,180	873	3,800	.889	1.02
November	4,730	2,090	3,430	.803	.90
December	4,100	1,080	2,550	.597	.69
The year	39,400	588	6,860	1.61	21.89

NOTE.—For accuracy see station description.

KENNEBEC RIVER AT BINGHAM, ME.

A measurement was made September 6, 1906, from the downstream side of the highway bridge at Bingham. The bench mark is top of third floor beam from the pier, 245 feet from the end of the inclined end post, downstream side of bridge, at left bank.

Distance to water surface, 23.55 feet; width, 419 feet; area, 1,680 square feet; discharge, 2,670 second-feet.

MOOSE RIVER NEAR ROCKWOOD, ME.

This station was established September 7, 1902. It is located 4 miles west of Kineo, Me., near the village of Rockwood, and 2 miles from the mouth of the river. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 60, and in Water-Supply Paper No. 198, where are given also data for previous years.

A measurement was made November 13, 1906, by F. E. Press with the following results:

Width, 232 feet; area, 630 square feet; gage height, 3.25 feet; discharge, 765 sec feet.

Daily gage height, in feet, of Moose River near Rockwood, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1.8	2.3	2.1	1.5	6.7	5.85	3.75	2.6	1.9	2.1	3.9
2	1.8	2.4	2.0	1.5	6.65	5.5	3.6	2.6	1.8	2.1	3.9
3	1.8	2.4	1.9	1.5	6.85	5.2	3.5	2.5	1.85	2.1	3.9
4	1.9	2.5	1.9	1.5	7.2	5.25	3.5	2.5	1.95	2.1	3.9
5	1.9	2.5	1.9	1.5	7.55	5.35	3.4	2.4	2.0	2.1	3.8
6	1.9	2.6	1.9	1.5	7.85	5.5	3.3	.....	1.9	2.1	3.7
7	1.9	2.6	1.8	1.5	8.0	5.4	3.25	.....	1.95	2.1	3.7
8	1.9	2.6	1.8	1.5	8.0	5.3	3.2	2.3	2.0	2.1	3.6
9	1.9	2.6	1.8	1.5	8.0	5.35	3.1	2.2	2.05	2.1	3.55
10	1.8	2.6	1.9	1.5	8.2	5.5	3.1	2.2	2.1	2.1	3.4
11	1.7	2.6	1.9	1.6	8.55	5.65	3.2	2.15	2.1	2.45	3.4
12	1.7	.....	1.8	1.6	8.6	5.6	3.35	2.1	2.1	2.6	3.4
13	1.7	.....	1.8	1.7	8.5	5.55	3.45	2.0	2.1	2.6	3.3
14	1.7	.....	1.8	1.7	8.4	5.35	3.5	2.0	2.1	2.9	3.3
15	1.7	.....	1.7	1.8	8.3	5.2	3.4	1.95	2.1	3.0	3.3
16	1.7	2.4	2.7	2.0	8.2	5.35	3.4	1.9	2.1	3.0	3.2
17	1.7	2.4	1.6	2.25	8.2	5.25	3.3	1.9	2.1	3.0	3.2
18	1.7	2.3	1.6	2.45	8.3	5.05	3.3	1.85	2.1	3.0	3.2
19	1.7	2.3	1.6	2.65	8.2	4.75	3.25	1.8	2.1	3.0	3.1
20	1.7	2.3	1.6	3.05	8.2	4.5	3.2	1.8	2.1	3.0	3.1
21	1.7	2.3	1.6	3.9	8.2	4.4	3.2	1.8	2.1	3.0	3.0
22	1.7	2.2	1.6	4.8	8.1	4.45	3.1	1.8	2.1	3.0	3.0
23	.....	2.2	1.6	5.3	7.6	4.5	3.1	1.9	2.1	3.0	3.2
24	.....	2.1	1.5	5.5	7.15	4.5	3.05	1.9	2.1	3.1	3.2
25	.....	2.1	1.5	5.75	6.85	4.45	3.0	1.9	2.1	3.2	2.5
26	1.9	2.1	1.4	5.85	6.6	4.25	2.95	1.8	2.1	3.45	2.2
27	2.0	2.1	1.4	6.0	6.5	4.2	2.9	1.9	2.1	3.65	3.3
28	2.0	2.1	1.4	6.35	6.4	4.05	2.85	1.9	2.1	3.8	3.35
29	2.1	.....	1.4	6.55	6.45	3.9	2.75	1.9	2.1	4.0	3.3
30	2.2	.....	1.4	6.6	6.25	3.8	2.7	1.9	2.1	4.0	3.25
31	2.2	.....	1.4	.....	6.05	.....	2.7	1.9	.....	4.0	.....

[a] Thickness of ice at gage, 0.4 feet; 10 feet from gage, 0.3 feet.

NOTE.—There was no ice above or below the gage during the winter season, 1905–6, except [illegible] along the banks of the river 5 or 6 feet from the gage. River frozen over at gage on December 7. During December the afternoon gage height is used, as the morning height is affected by anchor ice. Open channel through ice throughout December.

Rating table for Moose River near Rockwood, Me., for 1902 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	88	2.50	414	3.60	968	5.40	2,432
1.50	108	2.60	454	3.70	1,032	5.60	2,629
1.60	130	2.70	496	3.80	1,098	5.80	2,830
1.70	154	2.80	539	3.90	1,166	6.00	3,035
1.80	180	2.90	584	4.00	1,236	6.20	3,245
1.90	208	3.00	631	4.20	1,382	6.40	3,455
2.00	238	3.10	681	4.40	1,538	6.60	3,670
2.10	270	3.20	733	4.60	1,703	6.80	3,890
2.20	303	3.30	788	4.80	1,875	7.00	4,110
2.30	338	3.40	846	5.00	2,055	8.00	5,275
2.40	375	3.50	906	5.20	2,240	9.00	6,500

NOTE.—The above table is strictly applicable only for open-channel conditions. It is based on eleven discharge measurements made during 1902–1906 and is well defined between gage heights 1.5 feet and [illegible] feet.

Monthly discharge of Moose River near Rockwood, Me., for 1906.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	303	154	191	0.281	0.32
.....	454	270	370	.544	.57
.....	270	88	155	.228	.26
.....	3,670	108	1,040	1.53	1.71
.....	6,000	3,090	4,790	7.04	8.12
.....	2,880	1,100	2,050	3.02	3.37
.....	1,060	496	744	1.09	1.26
.....	454	180	262	.388	.45
.....	270	180	255	.375	.42
.....	1,240	270	592	.871	1.00
.....	1,170	303	826	1.21	1.35
.....	631	454	548	.806	.93
ar.....	6,000	88	985	1.45	19.76

scharge interpolated for days on which gage was not read.
rated as follows: January to March and December, good: April to November, excellent.

ROACH RIVER AT ROACH RIVER, ME.

ation was established November 10, 1901. It is located near ge of Roach River. The conditions and the bench marks ibed in Water-Supply Paper No. 165, page 63, and in Water Paper No. 198, where are given also data for previous years.

ily gage height, in feet, of Roach River at Roach River, Me., for 1906.

	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....				.....	2.5	2.9	2.5	2.3	2.2	2.2	2.5	2.3
.....				.....	2.5	4.55	3.6	2.3	2.2	2.2	2.5	2.3
.....				.....	2.6	6.3	3.6	2.6	2.2	2.2	2.5	2.3
.....				.....	2.6	5.8	3.6	2.6	2.2	2.2	2.5	2.3
.....				.....	2.6	3.65	3.6	2.6	2.2	2.2	2.5	2.3
.....				.....	3.6	2.9	3.6	2.8	2.2	2.2	2.5	2.3
.....				.....	3.6	2.9	3.6	2.8	2.2	2.2	2.5	2.3
.....				.....	4.2	2.5	3.6	2.8	2.2	2.4	2.3	2.3
.....				.....	4.7	2.5	2.2	2.8	2.2	2.4	2.3	2.3
.....				.....	5.6	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				.....	5.2	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				.....	5.4	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				.....	5.4	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				.....	4.15	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				2.2	2.9	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				2.2	2.9	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				2.2	6.3	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				2.2	4.2	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				2.2	2.9	2.5	2.2	2.2	2.2	2.4	2.3	2.3
.....				2.2	2.9	2.5	3.3	2.2	2.2	2.4	2.3	2.3
.....				2.2	2.9	2.5	3.3	2.2	2.2	2.4	2.3	2.3
.....				2.2	6.2	2.5	3.3	2.2	2.2	2.6	2.3	2.3
.....				2.2	2.9	2.5	3.3	2.2	2.2	2.6	2.3	2.3
.....				2.3	6.2	2.5	3.3	2.2	2.2	2.6	2.3	2.3
.....				2.3	2.9	2.5	2.85	2.2	2.2	2.6	2.3	2.3
.....				2.35	2.9	2.5	2.4	2.2	2.2	2.6	2.3	2.3
.....				2.35	3.25	2.5	2.4	2.2	2.2	2.6	2.3	2.3
.....				2.35	3.25	2.5	2.2	2.2	2.2	2.6	2.3	2.3
.....				2.35	3.25	2.5	2.2	2.2	2.2	2.6	2.3	2.3
.....				2.35	2.9	2.5	2.2	2.2	2.2	2.6	2.3	2.3
.....				.....	2.9	.....	2.2	.....	2.2	2.5	.....	2.3

ver frozen January 1 to April 15, but a small portion of the channel was open opposite the reater part of the winter season. The thickness of the ice varied from 0.2 to 0.7 foot.
ably somewhat affected by ice conditions during December.

Rating table for Roach River at Roach River, Me., for 1901 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.20	46	3.10	338	4.00	730	4.90	1,170
2.30	68	3.20	379	4.10	775	5.00	1,225
2.40	94	3.30	421	4.20	820	5.20	1,335
2.50	122	3.40	463	4.30	865	5.40	1,445
2.60	153	3.50	506	4.40	915	5.60	1,555
2.70	186	3.60	550	4.50	965	5.80	1,670
2.80	221	3.70	595	4.60	1,015	6.00	1,790
2.90	258	3.80	640	4.70	1,065	6.20	1,910
3.00	298	3.90	685	4.80	1,115	6.30	1,970

NOTE.—The above table is applicable only for open-channel conditions. It is based on ten discharge measurements made during 1902–1905, and is fairly well defined.

Monthly discharge of Roach River at Roach River, Me., for 1906.

[Drainage area, 85 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (15-30)	81	46	59.7	0.702	[illegible]
May	1,970	122	596	7.01	[illegible]
June	1,970	122	293	3.45	[illegible]
July	550	46	232	2.73	[illegible]
August	221	46	80.4	.946	[illegible]
September	46	46	46.0	.541	[illegible]
October	153	46	101	1.19	[illegible]
November	122	68	80.6	.948	[illegible]
December	68	68	68.0	.800	[illegible]

NOTE.—Values are rated as follows: April and August to December, fair; May to July, good.

DEAD RIVER NEAR THE FORKS, MAINE.

This station was established September 29, 1901. It is located 1½ miles west of The Forks. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 66, and in Water-Supply Paper No. 198, where are given also data for previous years.

Discharge measurements of Dead River near The Forks, Maine, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 8	F. E. Pressey	258	1,250	4.35	7,[illegible]
May 8	do	260	1,250	4.28	7,[illegible]
September 5	do	220	398	0.85	[illegible]

Daily gage height, in feet, of Dead River near The Forks, Maine.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.85	3.55	1.25	0.85	0.75	0.75	1.4	[illegible]
2		4.4	2.35	1.15	.85	.85	.75	1.3	[illegible]
3		4.1	2.15	1.15	.75	.85	.75	1.25	[illegible]
4		4.2	1.95	1.15	.75	.8	.75	1.15	[illegible]
5		3.7	2.95	1.15	.75	.75	.75	1.05	[illegible]
6		4.35	3.05	1.15	.75	.75	.65	1.05	[illegible]
7		4.35	3.7	1.05	.75	.75	.65	.95	[illegible]
8		3.65	3.95	1.05	.65	.75	.65	.95	[illegible]
9		3.85	3.7	1.05	.65	.75	1.15	.95	[illegible]
10	2.65	3.9	2.7	1.2	.65	.75	1.4	.95	[illegible]

Daily gage height, in feet, of Dead River near The Forks, Maine—Continued.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
.....	2.65	4.25	3.6	1.3	0.65	0.85	1.65	1.05	1.25
.....	2.55	4.75	3.95	1.65	.65	.85	1.55	1.05	1.25
.....	2.45	3.95	2.5	1.8	.65	.8	1.65	.95	1.25
.....	2.45	4.05	2.0	1.65	.65	.75	1.3	.95	.....
.....	2.35	3.8	1.95	1.6	.65	.75	1.25	1.05	.....
.....	2.6	3.85	1.6	1.35	.65	.75	1.15	1.05	.....
.....	3.0	3.85	1.7	1.35	.6	.75	.95	1.05	.....
.....	3.2	4.35	1.55	1.35	.55	.75	.95	1.05	.....
.....	3.4	3.9	1.45	1.35	.65	.75	.9	1.05	.....
.....	3.6	3.65	1.4	1.25	.65	.75	.85	1.05	.....
.....	3.85	3.85	1.35	1.25	.75	.75	.85	1.15	.....
.....	4.55	3.4	1.25	1.25	.75	.75	1.25	1.25	.....
.....	4.65	4.0	1.5	1.25	.75	.75	1.5	1.35	.....
.....	4.15	3.4	1.65	1.25	.85	.85	1.8	1.25	.....
.....	3.8	3.55	2.0	1.15	.85	.85	1.85	1.15	.....
.....	3.4	2.6	1.9	1.15	.85	.75	1.95	1.15	.....
.....	3.0	3.0	1.8	1.05	.75	.75	2.05	1.15	.....
.....	3.25	3.05	1.6	.95	.75	.75	1.9	1.05	.....
.....	3.55	3.95	1.4	.95	.75	.75	1.85	1.05	.....
.....	3.45	3.25	1.35	.85	.75	.65	1.7	1.05	.....
.....	.....	3.15	.....	.85	.75	.....	1.55	.....	.....

OTE.—The river was frozen from January 1 to April 10, when the ice broke up.

n February 27, 1906, cakes of ice were piled up on the shore and the river was l of cakes of ice frozen in an ice field. The ice jam extended from the mouth of the er to about 1,000 feet above the cable. Near the cable and gage the ice cakes med drifts along the channel of the river 2 to 3 feet above the normal ice cover. ere were 10 feet of open channel opposite the gage. The river at the cable was frozen rely over. River frozen over December 14–31. The following comparative readings e made:

Comparative ice and water readings.

Date.	Midstream at gage.			Midstream at cable.	
	Water surface.	Top of ice.	Thickness of ice.	Thickness of ice.	Water surface to bottom of ice.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*
ruary 27	2.2	2.3	1.6	1.0	0.9
ch 7	2.3	2.4	1.7	1.2	1.1
ch 14	2.2	2.3	1.7	1.2	1.1
ch 21	2.4	2.5	1.6	1.8	1.7
ch 28	2.5	2.4	1.6	1.6	1.6
il 4	2.5	2.3	1.2	(a)	(a)

a Water over top of ice.

Rating table for Dead River near The Forks, Maine, for 1902 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
0.50	110	1.50	1,225	2.50	2,780	3.50	4,990
0.60	185	1.60	1,365	2.60	2,970	3.60	5,260
0.70	270	1.70	1,505	2.70	3,160	3.70	5,540
0.80	365	1.80	1,650	2.80	3,360	3.80	5,830
0.90	470	1.90	1,795	2.90	3,570	3.90	6,130
1.00	580	2.00	1,945	3.00	3,790	4.00	6,430
1.10	700	2.10	2,100	3.10	4,010	4.20	7,060
1.20	825	2.20	2,260	3.20	4,240	4.40	7,730
1.30	955	2.30	2,430	3.30	4,480	4.60	8,420
1.40	1,090	2.40	2,600	3.40	4,730	4.80	9,140

OTE.—The above table is applicable only for open-channel conditions. It is based on nineteen dis- rge measurements made during 1903–1906, and is well defined between gage heights 0.7 foot and 2.0 .

Rating table for Carrabassett River near North Anson, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet*	*Sec.-ft.*
−0.10	77	1.10	595	2.30	1,690	4.00	3,750
.00	92	1.20	675	2.40	1,795	4.20	4,020
.10	110	1.30	755	2.50	1,900	4.40	4,290
.20	133	1.40	840	2.60	2,010	4.60	4,560
.30	160	1.50	925	2.70	2,120	4.80	4,830
.40	193	1.60	1,015	2.80	2,235	5.00	5,100
.50	233	1.70	1,105	2.90	2,350	5.20	5,370
.60	280	1.80	1,195	3.00	2,470	5.40	5,640
.70	335	1.90	1,290	3.20	2,710	5.60	5,910
.80	395	2.00	1,385	3.40	2,955		
.90	455	2.10	1,485	3.60	3,210		
1.00	520	2.20	1,585	3.80	3,480		

TE.—The above table is applicable only for open-channel conditions. It is the same as the 1905 above gage height 1 foot. Below gage height 1 foot it is based on one measurement made during and probably represents closely the conditions of flow as they existed during that year.

Monthly discharge of Carrabassett River at North Anson, Me., for 1906.

[Drainage area, 340 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
e	5,780	1,690	2,980	8.75	9.76
	3,880	755	1,960	5.77	6.65
	1,690	160	708	2.08	2.32
	1,100	160	389	1.14	1.31
st	1,100	92	215	.632	.73
mber	280	77	119	.350	.39
ber	3,750	92	774	2.28	2.63
mber	840	233	408	1.20	1.34
nber	1,480	193	759	2.23	2.57

pen-channel rating was applied April 1 to 18 which probably gave daily discharges somewhat in s of their true values.

TE.—Values are rated as follows: April, August, September, and December fair; remainder of d good.

SANDY RIVER NEAR MADISON, ME.

This station was established March 23, 1904, by F. E. Pressey. It ocated at the dam of the Madison Electric works, just over the vn line in Stark, but is nearer the Madison post-office. The conions at the station and the bench marks are described in Waterply Paper No. 165, page 71, and in Water-Supply Paper No. 198, ere are given also data for previous years.

Daily discharge, in second-feet, of Sandy River near Madison, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Oct.	Nov.	Dec.
	231	539	593	1,223	2,458	2,478	.....	244	396
	231	467	595	1,292	2,761	2,353	.....	266	194
	200	374	517	1,050	2,252	3,747	.....	312	246
	229	372	363	1,141	2,252	3,203	.....	397	339
	263	361	444	1,711	1,609	2,312	.....	322	304
	286	407	360	2,882	2,974	2,166	.....	243	279
	236	491	339	2,985	2,901	3,219	.....	206	359
	286	595	326	2,243	2,741	2,994	.....	213	373
	373	555	303	2,371	2,607	3,391	.....	213	393
	429	564	321	2,280	4,050	2,788	346	256	270

Daily discharge, in second-feet, of Sandy River near Madison, Me., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Oct.	Nov.	Dec.
11	304	475	182	1,727	3,584	2,520	933	329	[illegible]
12	351	565	294	1,748	2,780	2,067	516	295	[illegible]
13	339	698	229	1,862	2,576	1,536	310	311	[illegible]
14	294	582	406	2,813	2,830	1,202	216	334	[illegible]
15	229	442	453	6,018	2,124	906	140	300	[illegible]
16	317	373	384	8,844	1,757	688	127	300	[illegible]
17	491	296	320	8,497	1,629	656	113	369	[illegible]
18	555	208	222	7,304	1,902	601	99	381	[illegible]
19	530	274	252	6,312	2,246	601	91	492	[illegible]
20	469	273	262	5,972	1,720	594	108	983	[illegible]
21	418	274	192	4,954	1,502	497	204	919	[illegible]
22	406	294	183	5,791	1,174	638	264	743	[illegible]
23	715	327	159	4,840	974	1,556	169	871	[illegible]
24	2,655	419	166	3,319	868	4,212	154	635	[illegible]
25	2,540	423	144	2,620	944	3,089	368	477	[illegible]
26	1,736	361	191	2,574	565	2,355	1,614	479	[illegible]
27	1,505	442	252	2,274	4,280	1,338	806	667	[illegible]
28	1,000	504	443	2,321	4,787	890	804	583	[illegible]
29	732	.....	1,070	2,503	5,082	677	711	428	[illegible]
30	627	.....	1,388	2,504	3,611	608	516	303	[illegible]
31	567	.....	1,406	.....	2,607	.....	335	.....	[illegible]

NOTE.—Flashboards 1.33 feet high were used for two-thirds of the length of the dam May 5 to June [illegible]. From July 1 to October 9 repairs of dam and construction of a log way were in progress and no records are available.

Monthly discharge of Sandy River near Madison, Me., for 1906.

[Drainage area, 650 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	2,660	200	630	0.969	1.12
February	698	208	427	.657	.68
March	1,410	144	412	.634	.73
April	8,840	1,050	3,470	5.34	5.96
May	5,080	565	2,460	3.78	4.36
June	4,210	497	1,800	2.86	3.19
October (10-31)	1,610	91	407	.626	.72
November	983	206	429	.660	.76
December	591	194	346	.532	.61

NOTE.—During February to March the values of monthly discharge are only approximate, owing to accumulation of ice on dam crest. During the remainder of the period discharges under about 300 second-feet vary from good to approximate; above 500 second-feet they are good.

COBBOSSEECONTEE STREAM AT GARDINER, ME.

Records of the flow of Cobbosseecontee Stream have been kept at the plant of the Gardiner Water Power Company since 1890, and these records have been furnished to the Survey by S. D. Warren & Co., through Mr. Joseph A. Warren.

The dam, which is the uppermost of eight on the last three-fourths mile of the river just before it enters the Kennebec, is of stone masonry with a timber apron at the toe. The downstream face has an approximate slope of one horizontal to four vertical. The crest is horizontal and is about 6 feet wide. The upstream slope is about one vertical to eight horizontal. The total length of the dam is about 100 feet, and flashboards 4.5 feet high are maintained continuously. The total head obtained is about 10 feet. The head-bay entrance is on

the right bank and from this runs a wooden penstock in which is situated a 39-inch Hercules wheel. In the head bay there is also a gatehouse with two gates which are kept partially open most of the time to regulate the proper flow down the river.

The records of flow are made up by considering:

(1) The flow over the dam—which is nothing except usually for a short time in the spring.

(2) The flow through the gates, which is regulated by means of tables drawn up for the company by Hiram F. Mills, showing the discharge through the two gates for different pond levels. The practical application of this method is to obtain a given flow at any time by setting these gates at the required gate opening, taking into account the flow through the wheel.

(3) The flow through the 39-inch wheel, which is ascertained from this gate opening and pond level, a table also being provided for this purpose by Mr. Mills.

The water pumped for the Gardiner supply is neglected in computations, being a small percentage of the flow. It is also assumed that the tail-water level remains constant. The leakage by the dam was measured during 1905 and found to be 10 second-feet. Since that time records have been corrected accordingly. On Sundays and legal holidays gates are closed and no water is allowed to run unless the lake is full.

It is considered that the estimates of flow at this point are ordinarily correct within 5 per cent. The very low water estimates may be in error as much as 10 per cent or more.

The conditions at this station are described in Water-Supply Paper No. 165, page 74, and in Water-Supply Paper No. 198, where are given also data for previous years.

Daily discharge, in second-feet, of Cobbosseecontee Stream at Gardiner, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	195	220	260	10	795	1,100	440	735	285	280	280	275
2	195	230	260	270	722	1,080	600	780	10	280	280	10
3	195	250	260	270	724	1,020	670	380	285	280	280	275
4	195	250	10	270	724	860	660	300	285	280	10	275
5	195	250	270	270	592	650	360	10	285	280	280	275
6	195	265	265	270	294	510	300	290	285	280	280	275
7	10	265	270	270	300	630	285	290	285	10	280	275
8	195	265	270	10	582	645	10	290	285	280	280	275
9	195	265	270	270	567	620	280	285	10	280	280	10
10	195	265	270	270	545	610	275	285	290	280	280	275
11	195	10	10	610	535	585	275	285	290	280	10	275
12	195	265	270	625	381	460	275	10	290	280	280	275
13	195	265	270	625	320	350	275	285	290	280	280	275
14	10	265	270	625	290	346	275	285	290	10	280	270
15	210	265	270	625	290	310	10	285	290	280	280	270
16	210	265	270	1,010	290	290	275	285	10	280	280	10
17	210	280	270	1,049	285	16	275	285	290	280	280	270
18	210	10	10	757	280	290	275	285	290	280	10	270
19	210	280	270	516	280	290	275	10	290	280	280	270
20	210	280	270	547	10	280	275	285	290	280	280	270

Daily discharge, in second-feet, of Cobbosseecontee Stream at Gardiner, Me., for 1906.—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	10	280	270	677	280	280	275	290	290	10	280	[illegible]
22	210	280	270	800	280	280	10	290	290	280	280	[illegible]
23	210	280	270	800	280	280	275	290	10	280	280	[illegible]
24	303	270	270	800	280	260	720	290	280	280	280	[illegible]
25	303	10	10	1,040	275	985	910	290	280	280	10	[illegible]
26	284	260	270	1,026	275	1,280	880	10	280	280	280	[illegible]
27	284	260	270	1,051	10	1,160	760	290	280	280	275	[illegible]
28	250	260	270	1,061	310	980	450	290	280	10	275	[illegible]
29	236	.....	270	1,000	717	310	15	285	280	280	160	[illegible]
30	216	.....	270	867	970	324	400	285	10	280	275	[illegible]
31	210	.....	270	.....	1,110	.....	640	285	.....	280	.....	[illegible]

NOTE.—Leakage of dam taken at 10 second-feet, as determined by measurements during 1905.

Monthly discharge of Cobbosseecontee Stream at Gardiner, Me., for 1906.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	303	10	198	0.825	[illegible]
February	280	10	236	.983	[illegible]
March	270	10	235	.979	[illegible]
April	1,060	10	610	2.54	[illegible]
May	1,110	10	436	1.82	[illegible]
June	1,280	16	569	2.37	[illegible]
July	910	10	377	1.57	[illegible]
August	780	10	285	1.19	[illegible]
September	290	10	240	1.00	[illegible]
October	280	10	245	1.02	[illegible]
November	280	10	240	1.00	[illegible]
December	275	10	221	.921	[illegible]
The year	1,280	10	324	1.35	[illegible]

NOTE.—For accuracy see station description.

ANDROSCOGGIN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Androscoggin River is formed by the junction of Magalloway River and the outlet of the Umbagog-Rangeley lakes, near the Maine-New Hampshire boundary line. For about 35 miles it flows southward into the State of New Hampshire, then turns abruptly to the east and flows into the State of Maine, then turns to the south and joins the Kennebec in Merrymeeting Bay. The last fall on the Androscoggin is at Brunswick, Me., above which place the drainage area is 3,470 square miles, about 80 per cent of this being in Maine. The greatest length of the basin is 110 miles, the greatest width 70 miles, while the river itself measures about 200 miles in length from the sources of Magalloway River to the coast. The drainage areas of the river and of some of its chief tributaries are given in Water-Supply Paper No. 165, page 75.

RIVER SURVEYS IN ANDROSCOGGIN DRAINAGE.

In order to point out the power and storage possibilities in the Androscoggin River drainage basin, surveys have been made as follows: A survey for the determination of the profile only was made from tide-water to Livermore Falls. A survey for the determination of the profile and plan of the river has been made from Livermore Falls to Errol dam at the outlet of Umbagog Lake.

From the data collected, sheets have been prepared showing, as far as available, profile of water surface, plan of the river, contours along the banks, and prominent natural or artificial features. The results of these surveys have been published on sheets and may be had on application to the Director of the Geological Survey.

ANDROSCOGGIN RIVER AT SHELBURNE, N. H.

This station was established May 30, 1903. It is located at the steel highway bridge about one-half mile north of the railway station at Shelburne, N. H. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 76, where are given also references to publications that contain data for previous years. Length of chain on April 30, 1906, was 20.67 feet.

Discharge measurements of Androscoggin River at Shelburne, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 30	T. W. Norcross	394	1,730	5.98	5,100
June 5	F. E. Pressey	394	1,920	6.18	6,110
August 23	G. M. Brett	390	966	4.12	1,600

Daily gage height, in feet, of Androscoggin River at Shelburne, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.85	.....	4.05	6.4	6.9	4.7	4.1	4.1	4.1	4.05	4.15
2	.....	5.45	.....	4.15	6.3	7.0	4.65	4.1	4.0	4.1	4.0	5.7
3	.....	.....	.....	4.2	6.4	7.0	4.6	4.1	4.2	4.1	3.95	6.4
4	.....	.....	5.8	4.15	6.2	6.6	4.6	4.15	4.1	4.15	3.9	6.85
5	.....	.....	.....	4.1	6.5	6.2	4.7	3.6	4.1	4.1	4.0	.....
6	.....	.....	.....	4.05	6.4	6.3	4.55	4.05	4.2	4.1	4.0	.....
7	6.3	.....	.....	4.05	6.7	6.95	4.5	4.2	4.1	4.1	3.95	.....
8	.....	.....	.....	3.9	6.7	6.9	4.4	4.1	4.15	4.1	3.95	.....
9	.....	.....	.....	4.05	7.05	6.7	4.5	4.2	4.05	4.1	4.0	6.8
10	.....	.....	.....	4.0	7.55	6.5	4.4	4.2	4.2	4.15	4.15	.....
11	.....	6.9	5.7	4.05	7.25	6.5	4.4	4.1	4.15	4.15	4.2	.....
12	.....	.....	.....	3.95	6.95	6.35	4.35	3.7	4.1	4.1	4.1	.....
13	.....	.....	.....	4.05	7.8	6.05	4.3	4.1	4.1	4.0	4.05	.....
14	6.2	.....	.....	4.05	7.5	5.8	4.25	4.1	4.1	3.95	4.1	.....
15	.....	.....	.....	5.05	7.15	5.65	3.9	4.2	4.1	4.05	4.2	.....
16	.....	.....	.....	5.75	7.0	5.6	4.2	4.1	4.0	4.05	4.2	7.2
17	.....	.....	.....	5.8	7.05	5.5	4.3	4.2	4.0	4.15	4.2	.....
18	.....	6.8	5.7	5.85	7.0	5.4	4.2	4.2	4.1	4.1	4.1	.....
19	.....	.....	.....	5.85	7.5	5.3	4.3	3.5	4.05	4.0	4.2	.....
20	.....	.....	.....	5.85	7.4	5.2	4.3	4.4	4.1	4.0	4.15	.....

Daily gage height, in feet, of Androscoggin River at Shelburne, N. H., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	6.25	.....	.....	6.35	7.2	5.2	4.2	4.25	4.0	4.0	4.1	.....
22	.....	.....	.....	6.45	7.0	5.05	3.75	4.2	4.1	4.1	4.1	.....
23	7.1	.....	.....	6.35	6.8	5.2	4.05	4.1	4.0	4.0	4.05	7.05
24	7.9	.....	.....	5.95	6.6	5.8	4.2	4.1	4.1	4.0	4.05	.....
25	7.3	6.9	5.4	5.85	6.9	5.5	4.2	4.1	4.0	4.2	3.95	.....
26	6.35	.....	.....	5.7	7.6	5.1	4.3	3.6	4.1	4.1	4.05	.....
27	5.7	.....	.....	5.75	8.1	5.0	4.2	4.45	4.1	4.1	4.05	.....
28	4.85	.....	.....	6.05	8.3	4.9	4.15	4.75	4.0	4.0	4.0	.....
29	5.2	.....	4.6	5.75	7.7	4.8	3.5	4.45	4.05	4.1	4.15	.....
30	5.1	.....	4.45	6.1	7.3	4.8	4.05	4.1	3.95	4.0	4.25	6.9
31	4.75	.....	4.35	.....	7.0	.....	4.05	4.15	.....	4.0	.....	.....

NOTE.—The following ice conditions prevailed during 1906: River frozen over January 1 to 23; clear of ice January 24 to February 2; frozen over February 3 to March 28; clear of ice the afternoon of March 29. River frozen over December 5 to 31. During the frozen period gage heights were taken to water surface through a hole cut in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 7	6.3	6.5	0.95	March 11	5.7	5.95	1.05
January 14[a]	6.2	6.35	1.25	March 18[d]	5.7	5.85	1.45
January 21	6.25	6.4	1.3	March 25[d]	5.4	5.6	1.65
January 23[b]	7.1	.....	.....	March 29[e]	4.6	.....	.....
February 11[c]	6.9	6.95	.85	December 2-4[e]	.....	.....	.....
February 18	6.8	6.9	1.05	December 9	6.8	7.0	.8
February 25[b]	6.9	.....	.....	December 16[g]	7.2	.....	.....
March 4[d]	5.8	5.9	.8	December 23	7.05	7.4	1.5
				December 30	6.9	7.1	1.4

[a] Left channel partly open.
[b] Water flowing over ice.
[c] Possible backwater from ice jam 1,000 feet below gage. About 6 inches of snow on ice.
[d] Left channel open.
[e] River open at gage; one reading.
[f] Backwater due to anchor ice below gage.
[g] Water about 1 foot deep flowing over ice.

Rating table for Androscoggin River at Shelburne, N. H., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.50	740	4.70	2,200	5.90	4,970	7.10	8,240
3.60	820	4.80	2,480	6.00	5,225	7.20	8,530
3.70	905	4.90	2,680	6.10	5,480	7.30	8,830
3.80	998	5.00	2,880	6.20	5,740	7.40	9,130
3.90	1,100	5.10	3,105	6.30	6,000	7.50	9,430
4.00	1,212	5.20	3,325	6.40	6,265	7.60	9,730
4.10	1,336	5.30	3,545	6.50	6,535	7.70	10,030
4.20	1,472	5.40	3,775	6.60	6,810	7.80	10,330
4.30	1,618	5.50	4,005	6.70	7,090	7.90	10,630
4.40	1,774	5.60	4,240	6.80	7,375	8.00	10,930
4.50	1,938	5.70	4,480	6.90	7,660	8.30	11,860
4.60	2,110	5.80	4,725	7.00	7,950	.....	.....

NOTE. The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903-1906 and is well defined between gage heights 4.3 feet and 7.7 feet.

UPPER AND LOWER DAMS ON ANDROSCOGGIN RIVER AT RUMFORD FALLS, ME.

Daily gage height, in feet, of Androscoggin River at Shelburne, N. H., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	6.25	.....	.....	6.35	7.2	5.2	4.2	4.25	4.0	4.0	4.1	.....
22	.....	.....	.....	6.45	7.0	5.05	3.75	4.2	4.1	4.1	4.1	.....
23	7.1	.....	.....	6.35	6.8	5.2	4.05	4.1	4.0	4.0	4.05	7.05
24	7.9	.....	.....	5.95	6.6	5.8	4.2	4.1	4.1	4.0	4.05	.....
25	7.3	6.9	5.4	5.85	6.9	5.5	4.2	4.1	4.0	4.2	3.95	.....
26	6.35	.....	.....	5.7	7.6	5.1	4.3	3.6	4.1	4.1	4.05	.....
27	5.7	.....	.....	5.75	8.1	5.0	4.2	4.45	4.1	4.1	4.05	.....
28	4.85	.....	.....	6.05	8.3	4.9	4.15	4.75	4.0	4.0	4.0	.....
29	5.2	.....	4.6	5.75	7.7	4.8	3.5	4.45	4.05	4.1	4.15	.....
30	5.1	.....	4.45	6.1	7.3	4.8	4.05	4.1	3.95	4.0	4.25	6.9
31	4.75	.....	4.35	.....	7.0	.....	4.05	4.15	.....	4.0	.....	.....

NOTE. The following ice conditions prevailed during 1906: River frozen over January 1 to 23; clear of ice January 24 to February 2; frozen over February 3 to March 28; clear of ice the afternoon of March 29. River frozen over December 5 to 31. During the frozen period gage heights were taken to water surface through a hole cut in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 7	6.3	6.5	0.95	March 11	5.7	5.95	1.05
January 14[a]	6.2	6.35	1.25	March 18[d]	5.7	5.85	1.45
January 21	6.25	6.4	1.3	March 25[d]	5.4	5.6	1.65
January 23[b]	7.1	.....	.....	March 29[e]	4.6	.....	.....
February 11[c]	6.9	6.95	.85	December 2-4[e]	.....	.....	.....
February 18	6.8	6.9	1.05	December 9	6.8	7.0	.8
February 25[b]	6.9	.....	.....	December 16[g]	7.2	.....	.....
March 4[d]	5.8	5.9	.8	December 23	7.05	7.4	1.5
				December 30	6.9	7.1	1.4

[a] Left channel partly open.
[b] Water flowing over ice.
[c] Possible backwater from ice jam 1,000 feet below gage. About 6 inches of snow on ice.
[d] Left channel open.
[e] River open at gage; one reading.
[f] Backwater due to anchor ice below gage.
[g] Water about 1 foot deep flowing over ice.

Rating table for Androscoggin River at Shelburne, N. H., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.50	740	4.70	2,290	5.90	4,970	7.10	8,240
3.60	820	4.80	2,480	6.00	5,225	7.20	8,530
3.70	905	4.90	2,680	6.10	5,480	7.30	8,830
3.80	998	5.00	2,890	6.20	5,740	7.40	9,130
3.90	1,100	5.10	3,105	6.30	6,000	7.50	9,430
4.00	1,212	5.20	3,325	6.40	6,265	7.60	9,730
4.10	1,336	5.30	3,545	6.50	6,535	7.70	10,030
4.20	1,472	5.40	3,775	6.60	6,810	7.80	10,330
4.30	1,618	5.50	4,005	6.70	7,090	7.90	10,630
4.40	1,774	5.60	4,240	6.80	7,375	8.00	10,930
4.50	1,938	5.70	4,480	6.90	7,660	8.30	11,860
4.60	2,110	5.80	4,725	7.00	7,950	.....	.....

NOTE. The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903-1906 and is well defined between gage heights 4.3 feet and 7.7 feet.

UPPER AND LOWER DAMS ON ANDROSCOGGIN RIVER AT RUMFORD FALLS

nthly discharge of Androscoggin River at Shelburne, N. H., for 1906.

[Drainage area, 1,500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	6,400	1,100	3,270	2.18	2.43
.....	11,900	5,740	8,200	5.47	6.31
.....	7,950	2,480	4,970	3.31	3.69
.....	2,290	740	1,620	1.08	1.24
.....	2,380	740	1,390	.927	1.07
.....	1,470	1,160	1,310	.873	.97
.....	1,470	1,160	1,300	.867	1.00
.....	1,540	1,100	1,310	.873	.97

ilues are rated as follows: April to June, good; July to November, fair, owing to measur - ust 23 indicating a possible change in conditions of flow.

ANDROSCOGGIN RIVER AT RUMFORD FALLS, ME.

ischarge of Androscoggin River at Rumford Falls since 1892 ı computed by Charles A. Mixer, resident engineer of the l Falls Power Company. These statistics are obtained by he actual measured quantities passing through the wheels to puted flow over the dam, using the customary Francis weir with modified coefficient. A view of the upper and lower shown in Pl. IV. The conditions at the station are described r-Supply Paper No. 165, page 80, where are given also refer- publications that contain data for previous years.

harge, in second-feet, of Androscoggin River at Rumford Falls, Me., for 1906.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
....	1,861	2,582	1,459	1,863	8,285	8,089	3,760	2,221	1,683	1,419	1,560	1,610
....	1,842	2,384	1,524	1,684	7,864	8,412	3,379	1,990	1,529	1,423	1,514	987
.....	1,637	1,850	1,579	1,832	7,523	8,484	3,124	1,879	1,359	1,467	1,429	918
.....	1,673	1,808	1,480	1,903	8,018	7,160	2,252	1,813	2,082	1,426	1,429	1,078
.....	1,839	1,805	1,277	2,384	7,003	6,272	3,068	1,675	2,137	1,421	1,294	1,086
.....	1,982	1,970	1,471	3,142	7,819	6,196	2,927	1,703	1,848	1,513	1,380	1,207
.....	1,794	1,850	1,378	2,697	7,493	9,157	2,578	1,867	1,680	1,448	1,348	1,222
.....	1,663	1,857	1,368	2,428	7,502	8,086	2,128	1,887	1,618	1,528	1,403	1,192
.....	1,638	1,835	1,352	2,485	7,888	7,924	2,371	1,779	1,548	1,670	1,365	1,156
.....	1,492	1,844	1,278	2,364	11,312	7,467	2,511	1,767	1,540	3,328	1,430	1,102
.....	1,602	1,846	1,200	2,270	10,202	7,342	3,071	1,715	1,590	2,885	1,370	1,252
.....	1,636	1,734	1,154	2,366	8,463	6,740	2,811	1,649	1,500	2,266	1,454	1,203
.....	1,727	1,855	1,235	2,480	9,803	5,953	2,430	1,518	1,473	2,066	1,567	1,238
.....	1,738	1,784	1,186	3,366	9,956	5,215	2,186	1,605	1,461	1,939	1,435	1,266
.....	1,611	1,788	1,186	5,993	8,804	4,671	1,908	1,473	1,406	1,892	1,403	1,284
.....	1,779	1,732	1,162	11,513	7,922	4,393	1,630	1,454	1,373	1,913	1,505	1,266
.....	1,847	1,769	1,150	10,085	8,043	4,141	2,200	1,442	1,340	1,848	1,484	1,292
.....	1,840	1,689	1,141	9,009	8,541	6,387	2,695	1,467	1,402	1,799	1,373	1,432
.....	1,779	1,661	1,111	8,716	9,476	5,466	2,195	1,368	1,335	1,758	2,000	1,346
.....	1,747	1,784	1,186	9,033	8,419	4,625	1,986	1,208	1,326	1,959	2,855	1,326
.....	1,731	1,724	1,136	9,421	7,194	4,059	2,246	1,910	1,299	2,230	2,406	1,340
.....	2,027	1,845	1,148	10,961	7,214	3,658	2,424	1,690	1,403	2,000	2,238	1,404
.....	3,612	2,043	1,129	9,960	7,079	4,122	2,353	1,576	1,433	1,715	2,187	1,408
.....	7,749	1,913	1,164	7,254	6,654	7,243	2,308	1,611	1,516	1,628	1,842	1,404
.....	4,908	1,788	1,115	6,191	7,843	6,746	2,114	1,660	1,582	2,275	1,638	1,378
.....	3,636	1,653	1,050	5,564	9,851	5,111	2,146	1,500	1,506	3,248	1,233	1,217
.....	3,296	1,772	1,225	5,802	11,274	4,442	1,957	2,046	1,454	2,540	1,888	1,393
.....	3,142	1,578	1,598	6,167	15,443	4,008	1,899	3,579	1,428	2,223	1,859	1,420
.....	2,846	.....	2,318	6,410	14,310	3,684	1,738	2,707	1,519	2,112	1,399	1,461
.....	2,548	.....	2,330	7,003	10,158	3,668	2,070	2,012	1,391	1,862	1,239	1,417
.....	2,551	.....	2,138	.....	8,460	.....	2,595	1,754	.....	1,637	.....	1,362

Monthly discharge of Androscoggin River at Rumford Falls, Me., for 1906.

[Drainage area, 2,090 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	7,750	1,490	2,350	1.12	1.29
February	2,580	1,580	1,850	.885	.92
March	2,330	1,050	1,360	.651	.75
April	11,500	1,680	5,410	2.59	2.89
May	15,400	6,650	8,920	4.27	4.92
June	9,160	3,660	5,960	2.85	3.18
July	3,760	1,630	2,420	1.16	1.34
August	3,580	1,210	1,790	.856	.99
September	2,140	1,300	1,530	.732	.82
October	3,330	1,420	1,950	.933	1.08
November	2,860	1,230	1,620	.775	.86
December	1,500	918	1,280	.612	.71
The year	15,400	918	3,040	1.45	19.75

ANDROSCOGGIN RIVER AT DIXFIELD, ME.

This station was established August 22, 1902. It is located about one-half mile west of Dixfield, at the highway bridge on the road to West Peru. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 82, where are given also references to publications that contain data for previous years.

Discharge measurements of Androscoggin River at Dixfield, Me., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 3	F. E. Pressey	496	3,220	10.24	9,250
June 7	do	487	2,970	9.71	7,140
September 10[a]	H. K. Barrows	356	1,130	7.64	1,620

[a] By wading in two channels.

Daily gage height, in feet, of Androscoggin River at Dixfield, Me., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.9	10.0	.....	.....	10.45	10.45	9.15	8.3	7.8	7.75	7.85	7.8
2	8.1	.....	.....	7.8	10.45	10.4	9.0	8.2	7.8	7.75	7.8	7.4
3	[a] 8.6	.....	9.3	8.0	10.4	10.6	8.75	8.05	7.75	7.7	7.8	7.65
4	[a] 10.25	.....	.....	8.0	10.2	10.25	8.5	8.0	8.05	7.8	7.85	[b] 8.4
5	[a] 9.7	.....	.....	8.2	10.2	9.95	8.75	8.0	8.2	7.75	7.8	[b] 8.5
6	[a] 9.05	.....	.....	8.6	10.3	9.7	8.65	7.85	8.05	7.7	7.8	.....
7	8.4	.....	.....	8.8	10.25	10.5	8.45	7.95	7.95	7.75	7.7	.....
8	8.7	10.6	9.1	8.4	10.2	10.6	8.25	8.0	7.85	7.9	7.7	8.1
9	.....	.....	8.9	8.4	10.35	10.4	8.35	8.0	7.9	7.85	7.8	8.7
10	[c] 8.9	.....	.....	8.25	11.3	10.4	8.55	8.0	7.8	8.75	7.75	.....
11	.....	.....	8.9	8.15	11.0	10.2	8.8	8.0	7.9	8.8	7.7	.....
12	.....	.....	.....	8.3	10.5	10.1	8.8	7.85	7.85	8.3	7.8	.....
13	[c] 8.9	.....	.....	8.3	10.7	9.85	8.45	7.9	7.8	8.1	8.0	.....
14	.....	.....	.....	8.85	10.95	9.6	8.25	7.9	7.8	8.15	7.85	.....
15	.....	.....	.....	9.5	10.6	9.4	8.15	7.75	7.7	7.95	7.75	.....
16	.....	.....	.....	11.45	10.4	9.25	8.0	7.75	7.75	8.15	7.85	8.6
17	.....	10.2	8.6	11.3	10.3	9.25	8.15	7.75	7.65	8.1	7.75	.....
18	.....	.....	.....	11.0	10.5	9.65	8.55	7.75	7.7	8.05	7.85	.....
19	.....	.....	.....	10.85	10.65	9.7	8.3	7.7	7.7	8.0	7.75	.....
20	9.1	.....	.....	10.75	10.4	9.45	8.05	7.8	7.65	8.05	8.1	.....

[a] Ice in channel causes the high water.
[b] Anchor ice causes back water.
[c] To top of ice about 0.3 foot thick.

ily gage height, in feet, of Androscoggin River at Dixfield, Me., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	.....	.....	.....	10.9	10.2	9.25	8.3	8.0	7.7	8.4	8.35	.....
.....	.....	.....	.....	11.2	10.15	9.0	8.55	8.0	7.7	8.2	8.3	.....
.....	14.1	.....	.....	11.15	10.1	9.2	8.4	7.9	7.85	8.1	8.25	8.7
.....	[a]15.05	9.3	8.0	10.55	10.05	10.3	8.3	7.9	7.75	7.95	8.15	.....
.....	14.25	.....	.....	10.05	10.15	10.2	8.1	7.9	7.8	8.05	8.05	.....
.....	13.05	.....	.....	9.8	10.8	9.6	8.05	7.8	7.8	9.05	7.95	.....
.....	12.65	.....	.....	9.75	10.95	9.35	8.0	7.75	7.8	8.55	7.95	.....
.....	11.45	9.3	.....	9.75	12.3	9.15	8.0	8.9	7.7	8.40	7.95	.....
.....	.....	.....	8.5	9.95	12.15	8.95	7.95	8.6	7.75	8.2	7.9	.....
.....	.....	.....	8.5	10.1	11.15	8.95	7.9	8.2	7.75	8.15	[b]7.7	8.8
.....	.....	.....	8.3	.....	10.6	.....	8.5	7.95	.....	8.0	.....	.....

[a] Ice jam below, open at gage. [b] Anchor ice running.

OTE.—The following ice condition prevailed during 1906: River open January 1 to 8; frozen over at : January 9 to January 23; open at gage January 24 to 28; frozen over January 29 to March 28; ı at gage March 29; clear of ice about April 1; frozen over December 6 to 31. During the frozen ɔd gage heights were taken to the water surface through a hole in the ice. The following com- ıtive readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
ıary 20	9.1	9.2	0.5	March 9	8.9	8.9	0.8
ıary 23	14.1	14.1	.....	March 11	8.9	8.9	.8
·uary 1	10.0	10.3	.8	March 17	8.6	8.7	.75
·uary 8	10.6	10.7	1.1	March 24	8.0	8.1	.6
·uary 17	10.2	10.3	.6	December 8	8.7	9.0	.7
·uary 24	9.3	9.3	.5	December 9	8.7	9.0	.7
·uary 28	9.3	9.3	.5	December 16	8.6	8.6	1.1
:h 3	9.3	9.4	.7	December 23	8.7	8.8	1.4
:h 8	9.1	9.1	.8	December 30	8.8	8.9	1.2

Rating table for Androscoggin River at Dixfield, Me., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
7.70	1,660	8.80	3,970	9.90	7,870	11.00	12,800
7.80	1,790	8.90	4,270	10.00	8,280	11.10	13,300
7.90	1,940	9.00	4,580	10.10	8,700	11.20	13,810
8.00	2,100	9.10	4,900	10.20	9,130	11.40	14,840
8.10	2,280	9.20	5,230	10.30	9,560	11.60	15,880
8.20	2,480	9.30	5,580	10.40	10,000	11.80	16,940
8.30	2,690	9.40	5,940	10.50	10,450	12.00	18,000
8.40	2,910	9.50	6,310	10.60	10,900	12.20	19,060
8.50	3,150	9.60	6,690	10.70	11,360	12.40	20,130
8.60	3,410	9.70	7,080	10.80	11,830		
8.70	3,680	9.80	7,470	10.90	12,310		

OTE.—The above table is applicable only for open-channel conditions. It is based on 12 discharge surements made during 1903-1906 and is well defined below gage heights 11.0 feet.

Monthly discharge of Androscoggin River at Dixfield, Me., for 1906.

[Drainage area, 2,230 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
il	15,100	1,790	6,940	3.11	3.47
'	19,600	8,490	11,000	4.93	5.68
'	10,900	4,420	7,540	3.38	3.77
'	5,060	1,940	2,950	1.32	1.52
ust	4,270	1,660	2,120	.951	1.10
;ember	2,480	1,600	1,810	.812	.91
ɔber	4,740	1,660	2,380	1.07	1.23
'ember	2,800	1,660	1,950	.874	.98

OTE.—Values are rated as follows: April to June, excellent; July to November, good.

PRESUMPSCOT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Presumpscot River is one of the most interesting as well as one of the best water-power streams of its size in the United States. It is the outlet of Sebago Lake, which lies about 17 miles northwest of Portland. The lake is fed by Crooked River, a stream heading 35 miles farther north and within 3 miles of the Androscoggin. The area of the lake is 46 square miles; the total water surface on the drainage basin is 97 square miles; the area of the drainage basin at the outlet of the lake is 420 square miles, and at the mouth of the river 600 square miles.

According to the survey made by Joseph A. Warren, of Cumberland Mills, the fall from the crest of the stone dam at the foot of Sebago Lake to mean low tide at the foot of the lower falls is 265.16 feet in a distance of 21.65 miles, or an average of 12.25 feet per mile.

During the past few years several new developments have been made along the river, so that the only portion now unimproved is the fall of 56 feet between Great Falls and Gambo Falls.

The tributaries of Presumpscot River are not of much importance, but some of them are outlets of ponds and have considerable fall, thus affording constant though small power. Crooked River, the chief feeder of Sebago Lake, has a number of falls, some of which are utilized.

The chief interest attaching to the river is its regularity of flow which is due to dams at the outlet of the lake. Nowhere in the United States is there a better example of the success of storage of water and regulation of the flow of a stream than on the Presumpscot.

PRESUMPSCOT RIVER AT OUTLET OF SEBAGO LAKE, MAINE.

Since January, 1887, the flow from Sebago Lake has been regularly recorded, the quantity being deduced during most of this time from the openings in the gates at the dam, the discharging capacity of which under different conditions of head has been determined and tabulated by Hiram F. Mills, of Lowell. A continuous record of the Sebago Lake level has been kept since January, 1872, and the records of lake level and discharge make an unusually complete and valuable series of data. These have been furnished from time to time by S. D. Warren & Co. The conditions at this station are described in Water-Supply Paper No. 165, page 85, where are given also references to publications that contain data for previous years.

y discharge, in second-feet, of Presumpscot River, at outlet of Sebago Lake, Maine, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	450	543	555	392	540	484	507	553	712	766	705	519
.....	490	578	668	548	540	510	634	582	358	766	705	406
.....	483	597	655	550	540	380	648	750	724	766	705	518
.....	493	419	433	555	540	550	571	747	724	766	408	518
.....	493	616	605	520	554	549	559	380	726	766	700	462
.....	487	630	538	555	397	524	639	767	728	766	699	482
.....	297	608	530	534	542	526	559	744	732	600	697	460
.....	476	610	533	379	550	636	486	761	700	742	697	450
.....	497	616	505	528	543	634	653	736	359	734	692	377
.....	505	611	540	530	543	362	650	765	733	625	692	447
.....	495	451	480	530	550	635	642	734	735	650	423	433
.....	508	598	542	531	543	643	647	369	746	717	690	425
.....	513	608	541	531	371	639	647	759	750	717	686	440
.....	337	643	533	532	543	650	662	759	730	528	685	446
.....	498	671	542	384	543	550	360	729	700	713	681	450
.....	517	671	542	534	543	625	648	740	434	713	685	417
.....	510	661	539	535	543	392	645	740	734	713	681	455
.....	510	452	392	535	600	624	658	759	734	713	515	457
.....	523	675	534	537	643	584	640	365	746	710	677	445
.....	515	695	540	538	386	600	645	752	746	710	674	458
.....	467	685	549	538	618	626	652	741	750	497	670	466
.....	483	677	544	370	640	644	382	741	744	710	670	460
.....	501	685	540	538	636	656	836	750	422	710	608	415
.....	500	667	539	534	636	250	731	735	756	710	523	519
.....	520	490	463	540	643	551	786	709	763	710	403	519
.....	520	687	537	540	644	549	729	355	766	708	541	517
.....	512	687	545	540	400	549	734	734	766	708	560	517
.....	663	678	552	534	462	549	728	724	768	572	557	519
.....	517	.....	550	396	392	550	423	667	768	707	557	517
.....	517	.....	540	540	288	584	712	700	374	707	532	417
.....	521	.....	542	.....	484	.....	530	722	.....	707	.....	517

Monthly discharge of Presumpscot River at outlet of Sebago Lake, Maine, for 1906.

[Drainage area, 420 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ıry	663	297	494	1.18	1.36
ıary	695	419	616	1.47	1.53
ı	668	392	537	1.28	1.48
	555	370	512	1.22	1.36
	644	288	529	1.26	1.45
	656	250	554	1.32	1.47
	836	360	624	1.49	1.72
st	767	355	681	1.62	1.87
mber	768	358	681	1.62	1.81
ıer	766	497	698	1.66	1.91
ımber	705	403	624	1.49	1.66
ıber	519	377	466	1.11	1.28
The year	836	250	585	1.39	18.90

SACO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Saco River receives its headwaters from the valleys and slopes of the White Mountains, at elevations of 4,000 to 5,000 feet. It drains an area of 1,720 square miles, of which 900 square miles lie in New Hampshire and the remainder in Maine. The slopes at the headwaters are very steep, with no lake storage. In the lower river are many good water powers, part of which are in use. The Great Falls, at Hiram, Me., are shown in Pl. V. (See also Pl. III, *B*.)

SACO RIVER NEAR CENTER CONWAY, N. H.

This station was established August 26, 1903. It is located at the wooden highway bridge between Center Conway and Redstone, N. H., about 2 miles from each place. The conditions and the bench marks are described in New Hampshire Forestry Reports for 1903-1906, and in Water-Supply Paper No. 165, page 87, where are given also references to publications that contain data for previous years. Elevation of bench mark, May 3, 1906, was 27.74 feet above datum of gage.

Discharge measurements of Saco River near Center Conway, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 3	T. W. Norcross	228	896	6.23	2,110
August 20 [a]	G. M. Brett	122	153	3.30	185
October 2 [b]	F. E. Pressey	125	134	3.27	141

[a] Right channel; measured by wading 300 feet below bridge.
[b] Right channel; measured by wading 230 feet below bridge.

Daily gage height, in feet, of Saco River near Center Conway, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		6.5	.....	4.35	6.2	6.2	4.9	4.3	3.4	3.2	4.0	.....
2		5.7	.....	4.2	6.3	6.45	4.8	4.05	3.55	3.2	3.9	.....
3			.....	4.15	6.3	6.3	4.65	3.9	3.5	3.2	3.75	.....
4			.....	4.3	6.45	5.25	4.65	3.8	3.5	3.25	3.8	.....
5			.....	4.85	6.55	5.05	4.4	3.75	3.45	3.2	3.75	.....
6			.....	5.25	6.55	5.8	4.35	3.7	3.4	3.2	3.7	.....
7	4.95		.....	5.45	6.25	6.6	4.3	3.7	3.4	3.2	3.7	.....
8			.....	4.7	5.7	6.2	4.3	3.7	3.35	3.5	3.7	.....
9			.....	4.7	7.85	5.85	4.2	3.7	3.35	3.6	3.65	.....
10			.....	4.65	6.35	5.3	4.2	3.7	3.3	3.55	3.7	.....
11		5.5	.....	4.65	5.95	5.1	4.15	3.65	3.35	5.55	3.65	.....
12			.....	4.8	6.1	4.95	4.1	3.6	3.45	4.9	3.75	.....
13			.....	5.25	6.45	4.85	4.0	3.55	3.4	4.5	3.7	.....
14	5.3		.....	5.1	6.4	4.65	3.95	3.5	3.45	4.45	3.75	.....
15			.....	7.5	6.3	4.6	3.9	3.4	3.35	3.6	3.7	.....
16			.....	9.25	6.55	4.5	3.9	3.4	3.3	3.55	3.65	.....
17			.....	7.8	6.6	4.5	3.85	3.35	3.3	3.55	3.65	.....
18		5.1	.....	7.65	6.65	6.65	3.9	3.4	3.2	3.5	3.7	.....
19			.....	7.6	6.75	5.65	3.85	3.35	3.2	3.5	3.9	.....
20			.....	7.75	6.65	5.05	3.75	3.3	3.15	3.5	4.3	.....

GREAT FALLS OF SACO RIVER AT HIRAM ME.

gage height, in feet, of Saco River near Center Conway, N. H., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	5.1	.....	.....	7.8	5.05	4.9	3.9	3.3	3.1	4.45	4.25	.....
.....	.....	.....	.....	6.2	4.9	4.6	5.1	3.35	3.05	4.1	4.2	.....
.....	.....	.....	.....	6.0	4.85	5.0	4.3	3.4	3.2	3.6	4.1	.....
.....	.....	.....	.....	6.0	4.8	6.65	4.25	3.45	3.2	3.55	4.1	.....
.....	9.0	.....	.....	6.05	5.05	5.9	4.1	3.5	3.2	3.9	4.1	.....
.....	6.65	.....	.....	6.25	5.4	5.35	3.85	3.4	3.15	5.7	4.1	.....
.....	6.25	.....	.....	6.55	5.75	4.9	3.7	3.45	3.2	4.55	4.1	.....
.....	6.2	.....	.....	6.55	7.45	4.75	3.75	4.5	3.2	4.25	4.15	.....
.....	6.35	.....	4.85	6.55	8.7	5.05	3.65	4.05	3.2	4.2	4.2	.....
.....	6.8	.....	4.65	6.5	7.0	5.3	4.6	3.7	.....	4.1	.....	.....
.....	6.75	.....	4.5	.....	6.6	.....	4.95	3.45	.....	4.0	.....	.....

'T.—The following ice conditions prevailed during 1906: River frozen January 1 to 25, except for open-water area in left span just above gage; ice went out January 25; river frozen over again ary 4. Narrow stretches of open water remained in left channel near gage for the rest of the winter ie ice was thin and weak. Ice went out the morning of March 29. River frozen December 1 to 31. g the frozen period gage heights were taken to water surface through a hole in the ice. The follow- mparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
ry 7	4.95	5.15	1.1	February 25	.....	4.95	.....
ry 14	5.3	5.45	1.5	March 4	.....	4.8	.....
ry 21	5.1	5.2	1.0	March 11	.....	4.25	.....
ary 4	.....	6.1	(a)	March 18	.....	4.75	.....
ary 11	5.5	5.55	.65	March 25	.....	4.5	.....
ary 18	5.1	5.15	.8				

a Ice thin.

Rating table for Saco River near Center Conway, N. H., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	100	4.20	504	5.40	1,272	7.20	3,030
3.10	115	4.30	557	5.50	1,349	7.40	3,285
3.20	133	4.40	612	5.60	1,428	7.60	3,555
3.30	154	4.50	669	5.70	1,509	7.80	3,835
3.40	178	4.60	728	5.80	1,592	8.00	4,120
3.50	206	4.70	789	5.90	1,677	8.20	4,425
3.60	238	4.80	852	6.00	1,764	8.40	4,740
3.70	274	4.90	917	6.20	1,950	8.60	5,060
3.80	314	5.00	984	6.40	2,150	8.80	5,395
3.90	358	5.10	1,053	6.60	2,355	9.00	5,735
4.00	404	5.20	1,124	6.80	2,570	10.00	7,600
4.10	453	5.30	1,197	7.00	2,795		

E.—The above table is applicable only for open-channel conditions. It is based on discharge rements made during 1903-1906 and is well defined between gage heights 3.3 feet and 9.0 feet.

Monthly discharge of Saco River near Center Conway, N. H., for 1906.

[Drainage area, 385 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	6,180	479	1,950	5.07	5.66
.....	5,220	852	2,150	5.57	6.42
.....	2,410	669	1,320	3.43	3.83
.....	1,050	256	521	1.35	1.56
t.....	669	154	261	.678	.78
nber.....	222	108	157	.408	.46
er.....	1,510	133	404	1.05	1.21
nber.....	557	256	363	.943	1.05

E.—Values are rated as follows: April to June, excellent; July, August, October, November, good; nber, fair.

MERRIMAC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Merrimac basin, which has a total drainage area of 5 square miles, lies in the States of New Hampshire and Massachus 3,815 square miles being in the former State and 1,200 square n in the latter. Merrimac River is formed at Franklin, N. H., by junction of Pemigewasset and Winnepesaukee rivers. The headwa of the Pemigewasset lie in the White Mountain region at elevat of, approximately, 2,000 feet; thence they flow southward thr New Hampshire with very steep slopes. On this branch of the rimac there is very little lake storage. Squam and New Found la aggregating about 20 square miles of surface area, are the only b of water of any importance. Above Plymouth probably 85 per of the basin is in heavy forest. A very insignificant amount of w power is utilized. Winnepesaukee River has its headwaters in eastern part of the State. A prominent characteristic of its bas the extent of the lake surface, aggregating 100 square miles. Th from Winnepesaukee Lake to the junction with Pemigewasset I is 225 feet in a distance of 14 miles.[a]

From Franklin, Merrimac River flows southward through the of New Hampshire for 56 miles, receiving Contoocook River fron west and Suncook River from the east. After entering Massa setts the river deflects to the east and flows in an easterly and n easterly direction for a distance of 40 miles, to Newburyport, w it enters an arm of the sea. Tide flows to Lawrence.

The drainage areas of Merrimac River and some of its principal utaries are given in Water-Supply Paper No. 165, page 91.

MERRIMAC RIVER AT FRANKLIN JUNCTION, N. H.

This station was established July 8, 1903. It is located at wooden railway bridge near Franklin Junction, about a mile b the union of Pemigewasset and Winnepesaukee rivers. The co tions and the bench marks are described in Water-Supply Paper 165, page 91, where are given also references to publications contain data for previous years.

Discharge measurements of Merrimac River at Franklin Junction, N. H., in 19

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis
		Feet.	*Sq. ft.*	*Feet.*	S
April 16	T. W. Norcross	270	3,750	15.98	
April 17	do	270	2,840	12.60	
April 17	do	270	2,620	11.75	
April 26	do	231	1,210	6.35	
July 20	G. M. Brett	223	815	4.60	
September 28	F. E. Pressey	216	695	4.06	
October 10	do	216	772	4.58	

[a] Tenth Census, vol. 16, p. 50.

ily gage height, in feet, of Merrimac River at Franklin Junction, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	5.4	5.3	4.75	.....	.....	7.3	.....	5.5	.....	4.1	4.5	4.5
.....	5 0	5.35	4.65	5.6	6.4	7.1	5.7	5.1	.....	4.0	4.5	.....
.....	4.8	5.3	4.7	5.5	6.3	.....	5.6	4.8	.....	4.05	4.4	4.5
.....	4.8	.....	.....	5.7	.....	6.6	.....	4.7	4.3	4.05	.....	4.3
.....	5.3	4.9	4.6	6.3	6.45	6.1	5.75	.....	4.3	4.0	4.3	4.2
.....	5.1	4.8	4.8	7.3	.....	6.0	5.6	4.6	4.3	4.0	4.3	4.25
.....	.....	4.85	4.7	6.8	6.15	7.3	5.3	4.6	4.3	.....	4.3	4.35
.....	4.8	4.8	4.7	.....	6.2	7.3	.....	4.6	4.4	4.1	4.2	4.3
.....	5.0	4.8	4.6	6.05	6.0	.....	4.9	4.5	.....	4.1	4.25	.....
.....	4.9	4.7	4.7	5.9	7.35	.....	4.9	4.4	4.3	4.5	4.3	5.05
.....	4.8	.....	.....	5.9	7.3	6.4	4.9	4.4	4.2	4.9	.....	4.9
.....	4.65	5.1	4.65	6.3	6.7	6.2	4.9	.....	4.1	4.5	4.45	4.85
.....	4.8	4.8	4.5	6.6	.....	6.0	4.8	4.6	4.2	4.4	4.5	4.7
.....	.....	4.6	4.5	7.0	7.6	5.8	4.55	4.45	4.1	.....	4.4	4.6
.....	4.8	4.6	4.5	.....	6.8	5.5	.....	4.4	4.0	4.3	4.3	4.5
.....	4.85	4.6	4.5	16.2	6.3	5.3	4.5	4.2	.....	4.2	4.2	.....
.....	5.0	4.5	4.5	12.1	6.3	.....	4.5	4.3	4.2	4.2	4.2	4.5
.....	5.0	.....	.....	10.1	6.85	6.2	4.8	4.2	4.15	4.25	.....	4.5
.....	4.95	4.5	4.4	9.45	.....	6.2	4.75	.....	4.0	4.2	4.1	4.6
.....	4.9	4.5	4.4	8.85	.....	6.0	4.6	4.1	4.05	.....	4.2	4.5
.....	.....	4.45	4.45	.....	5.9	5.7	4.7	4.1	4.1	.....	4.6	4.6
.....	5.3	.....	4.5	.....	5.6	5.6	.....	4.15	4.0	5.0	4.95	4.6
.....	5.65	4.9	4.4	8.2	5.3	5.4	5.0	4.25	.....	4.7	4.8	.....
.....	.....	4.95	4.4	7.5	5.3	.....	4.85	4.3	4.2	4.6	4.8	4.8
.....	9.6	.....	.....	6.8	5.6	6.85	4.7	4.3	4.2	4.5	.....	4.5
.....	7.15	5.05	4.3	6.45	6.3	6.4	4.6	.....	4.1	6.6	4.7	4.4
.....	6.05	5.1	4.45	6.2	.....	6.15	4.6	4.2	4.0	.....	4.6	4.45
.....	.....	5.0	5.35	6.05	14.7	5.9	.....	4.2	4.0	.....	4.65	4.45
.....	5.6	.....	5.9	.....	14.2	5.8	4.15	4.9	4.0	4.65	4.6	4.35
.....	5.2	.....	6.2	6.2	.....	5.8	4.5	4.6	.....	4.7	4.5	.....
.....	5.1	.....	6.1	.....	8.15	.....	.....	4.5	.....	4.6	.....	.....

E.—The river does not usually freeze at or near the gage, and the flow is probably not greatly d by ice conditions.

Rating table for Merrimac River at Franklin Junction, N. H., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.00	950	5.20	2,530	6.30	4,360	7.80	7,200
4.10	1,060	5.30	2,680	6.40	4,540	8.00	7,600
4.20	1,170	5.40	2,840	6.50	4,720	8.20	8,000
4.30	1,290	5.50	3,000	6.60	4,900	8.40	8,400
4.40	1,410	5.60	3,160	6.70	5,080	8.60	8,800
4.50	1,540	5.70	3,320	6.80	5,270	8.80	9,200
4.60	1,670	5.80	3,490	6.90	5,460	9.00	9,600
4.70	1,800	5.90	3,660	7.00	5,650	9.20	10,020
4.80	1,940	6.00	3,830	7.20	6,030	9.40	10,440
4.90	2,080	6.10	4,000	7.40	6,410	9.60	10,860
5.00	2,230	6.20	4,180	7.60	6,800	9.80	11,280
5.10	2,380						

E.—The above table is applicable only for open-channel conditions. It is based on discharge rements made during 1905–6 and is well defined. Above gage height 9 feet the rating curve is a it, the difference being 210 per tenth. The curve for high stages has been drawn about 5 to 10 per reater than the 3 high-water measurements of 1906, all of which were made on a rapidly falling It is considered as closely representing the flow for stationary stages.

Monthly discharge of Merrimac River at Franklin Junction, N. H., for 1906.

[Drainage area, 1,460 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inch
January	10,900	1 730	2,950	2.02	
February	2,760	1,170	1,980	1.36	
March	4,180	1,120	1,830	1.25	
April	24,700	3,000	6,610	4.53	
May	21,600	2,680	5,930	4.06	
June	6,220	2,680	4,210	2.88	
July	3,490	1,120	2,140	1.47	
August	3,000	1,060	1,500	1.03	
September	1,410	950	130	.774	
October	4,900	950	,620	1.11	
November	2,160	1,060	,470	1.01	
December	2,300	1,170	,630	1.12	
The year	24,700	950	2,750	1.88	

NOTE.--The discharge has been estimated for days on which the gage was not read.

Values are rated as follows: January to August, excellent; September, good; October to Dece fair, owing to measurement of October 10, indicating a possible change in conditions of flow.

MERRIMAC RIVER AT GARVINS FALLS, N. H.

The power at Garvins Falls—4 miles below Concord—is one of best on Merrimac River. There has been a dam at this point si 1815, first in connection with the Old Bow Canal and later to furn power for a pulp mill. This privilege has since become the prope of the Manchester Traction, Light and Power Company, and has b more completely developed.

Careful records of the pond and tail-race levels, wheel openin etc., have been kept by the company since the completion of the n dam in 1904, and have been furnished for computations of flow J. Brodie Smith, manager. The conditions at this station described in Water-Supply Paper No. 165, page 94.

Discharge measurements of Merrimac River at Garvins Falls, N. H., in 1904-1906

Date.	Hydrographer.	Width.	Area of section.	Reference point to water surface.	Disch
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.*
November 3	T. W. Norcross	358	1,410	25.69	
November 10	do	320	1,200	26.19	
November 23	do	345	1,270	25.88	
1906.					
April 18	T. W. Norcross	463	5,070	17.14	
April 18	do	463	4,960	17.50	
April 18	C. R. Adams	463	5,110	17.14	
October 10	Barrows and Pressey	296	1,120	26.25	
October 11	F. E. Pressey	351	1,260	26.02	
October 11	do	367	1,300	25.80	

NOTE.—All of these measurements were made from the downstream side of the Hammond bridge, Concord, N. H., for the purpose of obtaining the coefficients of the dam.

Daily discharge, in second-feet, of Merrimac River at Garvins Falls, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4,480	4,260	3,370	8,300	6,150	13,000	5,480	5,020	2,040	1,220	2,040	2,240
.....	4,040	4,230	3,380	7,080	6,310	9,740	6,270	3,720	1,500	1,280	1,970	2,140
.....	3,380	4,370	3,360	6,280	6,540	8,530	5,820	3,140	1,380	1,210	1,870	1,580
.....	2,940	3,230	3,400	6,260	7,920	8,120	5,440	2,730	1,460	1,290	1,900	1,990
.....	3,470	2,890	3,350	6,770	7,240	6,560	5,920	2,540	1,680	1,340	1,550	1,640
.....	3,860	2,860	3,720	9,820	6,900	5,800	6,200	2,210	1,740	1,260	1,470	1,980
.....	3,780	2,540	3,630	10,810	6,510	6,850	4,910	2,400	1,510	1,270	1,620	1,970
.....	3,070	2,430	3,330	9,080	6,110	9,030	4,240	2,370	1,530	1,120	1,580	1,620
.....	2,880	2,250	3,080	7,840	5,550	8,920	3,650	3,800	1,370	1,430	1,780	2,090
.....	2,890	2,240	3,100	7,540	6,150	8,380	3,520	2,210	1,290	1,820	1,540	1,680
.....	2,870	2,400	3,440	6,840	9,050	7,220	3,480	2,120	1,370	2,410	1,580	1,880
.....	3,010	2,220	2,960	8,250	7,300	6,500	3,320	1,910	1,350	2,440	1,750	1,780
.....	3,130	2,420	2,750	9,490	5,860	5,490	3,080	1,760	1,350	1,910	1,980	1,910
.....	3,140	2,570	2,520	10,660	7,930	4,830	2,880	1,970	1,390	1,930	2,100	1,990
.....	2,870	2,550	1,860	12,680	7,110	4,360	2,590	2,060	1,310	1,710	2,180	1,980
.....	3,260	2,610	2,600	27,820	5,690	3,860	2,400	1,860	1,260	1,610	1,800	2,320
.....	3,630	2,830	2,750	29,560	5,410	3,980	2,420	1,900	1,310	1,420	1,900	1,880
.....	3,780	2,990	2,400	22,080	5,990	7,640	2,760	1,910	1,260	1,430	1,900	1,900
.....	3,520	2,690	2,130	17,630	7,080	8,630	2,950	1,810	1,320	1,480	1,820	1,830
.....	3,290	2,650	1,840	15,160	5,820	7,720	2,720	1,460	1,420	1,540	2,770	1,860
.....	3,140	2,700	2,520	14,060	5,150	6,500	2,540	1,800	1,450	2,140	4,060	1,920
.....	3,090	3,020	2,470	14,410	4,280	5,440	2,640	1,720	1,320	2,610	3,720	1,960
.....	5,540	3,600	2,180	13,570	3,730	4,750	2,780	1,720	1,240	2,300	3,530	2,270
.....	15,660	4,160	2,190	10,940	3,400	6,140	3,230	1,850	1,360	2,020	3,350	1,890
.....	17,100	3,970	2,320	8,860	3,660	9,570	3,100	1,770	1,210	1,990	3,050	2,060
.....	10,800	3,990	2,230	7,640	4,990	8,360	2,750	1,720	1,340	3,440	2,540	1,550
.....	8,380	4,710	2,230	6,800	5,750	7,010	2,560	1,660	1,310	3,940	2,280	2,030
.....	6,800	3,750	3,290	6,240	17,950	5,850	2,570	1,780	1,340	2,910	2,540	1,930
.....	6,040	.....	8,010	5,980	28,010	5,020	2,290	2,420	1,350	2,220	2,760	2,110
.....	5,180	.....	8,880	5,720	25,260	4,630	1,770	2,370	1,340	2,140	2,520	2,460
.....	4,410	.....	9,090	.....	18,360	.....	3,270	2,160	.....	2,040	.....	1,710

Monthly discharge of Merrimac River at Garvins Falls, N. H., for 1906.

[Drainage area, 2,340 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	17,100	2,870	4,950	2.12	2.44
February	4,710	2,220	3,110	1.33	1.38
March	9,090	1,840	3,370	1.44	1.66
April	29,600	5,720	11,100	4.74	5.29
May	28,000	3,400	8,170	3.49	4.02
June	13,000	3,800	6,950	2.97	3.31
July	6,270	1,770	3,530	1.51	1.74
August	5,020	1,460	2,260	.966	1.11
September	2,040	1,240	1,400	.598	.67
October	3,940	1,120	1,900	.812	.94
November	4,060	1,470	2,250	.962	1.07
December	2,460	1,550	1,940	.829	.96
The year	29,600	1,120	4,250	1.81	24.59

NOTE.—Values are rated as good.

MERRIMAC RIVER AT LAWRENCE, MASS.

Records of flow of the Merrimac at Lawrence have been kept for more than fifty years, but have never been published in full. Data in regard to the flow are furnished by R. A. Hale, principal assistant engineer of the Essex Water Power Company. The conditions at the station are described in Water-Supply Paper No. 165, page 95, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Merrimac River at dam at Lawrence, Mass., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7,701	6,484	7,473	15,770	7,945	20,079	6,426	5,374	2,202	2,288	3,344	[illegible]
2	6,896	6,201	6,268	15,330	8,162	15,347	9,087	7,314	1,251	2,379	3,167	[illegible]
3	8,152	4,087	5,698	13,070	8,359	12,957	8,739	5,357	1,635	2,237	2,126	[illegible]
4	5,827	3,692	8,095	11,970	8,641	12,471	7,183	4,339	3,764	2,206	452	[illegible]
5	6,091	5,227	12,552	11,950	9,198	10,974	8,890	4,044	2,816	2,266	3,438	[illegible]
6	6,175	3,693	14,218	13,940	7,998	9,410	8,980	5,335	2,716	1,514	3,352	[illegible]
7	5,923	4,062	11,207	17,000	9,276	9,015	7,386	4,468	2,451	132	3,246	[illegible]
8	6,595	3,753	9,714	14,290	8,735	11,016	5,663	3,945	1,535	1,977	2,646	[illegible]
9	5,551	3,734	8,490	13,940	8,277	11,419	5,945	3,969	101	1,936	2,460	[illegible]
10	5,042	2,301	7,765	13,840	7,965	10,575	5,125	3,643	2,205	2,155	1,652	[illegible]
11	4,560	2,158	7,313	14,800	9,914	10,623	4,729	2,251	2,256	2,652	334	[illegible]
12	4,383	4,978	8,534	17,900	9,501	9,212	4,614	1,986	2,246	2,723	2,851	[illegible]
13	3,013	3,803	7,052	19,400	7,803	8,018	4,596	4,435	2,282	1,574	2,862	[illegible]
14	3,800	3,681	6,352	19,200	8,312	6,897	3,361	3,327	2,127	662	3,270	[illegible]
15	5,578	3,761	5,020	17,600	8,974	6,352	2,825	2,877	1,433	3,506	3,285	[illegible]
16	5,025	3,503	4,542	25,800	7,852	4,720	4,548	2,946	76	3,127	3,636	[illegible]
17	6,174	2,345	3,436	35,400	6,797	5,283	3,229	2,850	2,145	3,011	2,406	[illegible]
18	7,145	2,497	4,322	29,298	6,863	12,608	3,102	1,995	2,184	2,540	941	[illegible]
19	6,781	4,921	5,416	22,112	7,087	15,349	3,649	839	2,134	2,471	4,121	[illegible]
20	5,587	3,663	4,424	19,830	6,783	13,500	4,137	3,641	2,174	1,497	3,405	[illegible]
21	4,958	3,680	4,301	17,289	7,014	10,995	3,522	2,945	2,107	133	4,995	[illegible]
22	6,467	5,161	4,482	15,786	5,657	9,087	3,138	2,734	1,367	2,525	5,046	[illegible]
23	7,437	8,029	4,851	16,601	4,715	7,374	4,701	2,571	103	2,850	5,289	[illegible]
24	13,845	9,200	3,030	14,856	4,818	7,361	3,796	2,709	2,143	3,337	4,072	[illegible]
25	23,900	7,210	3,219	12,634	4,588	10,934	4,456	1,581	2,189	3,186	3,518	[illegible]
26	19,804	9,980	5,317	10,785	4,451	11,674	4,285	753	2,309	3,201	5,094	[illegible]
27	13,643	11,131	4,410	9,749	6,184	9,747	3,932	3,456	2,518	2,671	4,611	[illegible]
28	10,626	10,085	7,508	8,474	12,300	8,050	2,620	2,804	2,386	3,449	3,629	[illegible]
29	9,629	.....	17,100	7,621	35,650	6,779	2,599	2,596	1,515	4,738	1,659	[illegible]
30	6,770	.....	18,600	8,537	36,910	5,595	4,602	2,619	167	3,648	4,823	[illegible]
31	6,403	.....	17,500	.....	27,639	.....	3,604	3,040	.....	3,308	.....	[illegible]
Total	237,571	143,020	238,218	484,781	314,348	303,421	153,469	102,743	56,537	75,991	95,024	[illegible]
Average	7,664	5,108	7,684	16,159	10,140	10,114	4,951	3,314	1,885	2,451	3,167	[illegible]

ekly flow, arranged in order of discharge, of Merrimac River at Lawrence, Mass., for 1906.

g Sunday—	Merrimac River at Lawrence (total drainage area=4,664 sq. m.).	Wasting into Merrimac from— Nashua River at Clinton (drainage area=118 sq. m.).	Sudbury River at Dam 1 (drainage area=75 sq. m.).	Lake Cochituate Bannister Brook (drainage area=19 sq. m.).	Total waste of these watersheds (total drainage area=212 sq. m.).	Net yield of Merrimac River from 4,452 square miles, in second-feet.	
	Second-feet for seven days.					Seven days.	Per sq. m.
.....	1,745	6	2	0	8	1,737	0.390
.....	1,804	6	2	0	8	1,796	.403
.....	1,859	6	2	0	8	1,851	.416
.....	1,890	6	2	0	8	1,882	.423
.....	1,954	8	2	0	10	1,944	.437
.....	2,145	6	2	0	8	2,137	.480
.....	2,327	6	2	0	8	2,319	.521
.....	2,405	5	2	0	7	2,398	.539
.....	2,419	7	3	0	10	2,409	.541
.....	2,453	5	2	0	7	2,446	.549
.....	2,518	5	2	0	7	2,511	.564
.....	2,567	6	3	0	9	2,558	.575
.....	2,596	5	72	0	77	2,519	.566
.....	2,632	4	42	0	46	2,586	.581
.....	2,748	5	31	0	36	2,712	.609
.....	2,753	7	8	0	15	2,738	.615
.....	2,980	5	2	0	7	2,973	.668
.....	3,031	5	2	0	7	3,024	.679
.....	3,327	5	5	0	10	3,317	.745
.....	3,510	4	28	0	32	3,478	.781
.....	3,561	3	39	0	42	3,519	.790
.....	3,618	7	11	0	18	3,600	.809
.....	3,657	7	30	0	37	3,620	.813
.....	3,770	6	2	0	8	3,762	.845
.....	4,246	4	92	32	128	4,118	.925
.....	4,347	5	30	0	35	4,312	.968
.....	4,456	5	24	0	29	4,427	.994
.....	4,706	4	51	0	55	4,651	1.045
.....	4,948	7	2	0	9	4,939	1.110
.....	5,344	6	6	0	12	5,332	1.198
.....	5,608	5	128	36	169	5,439	1.222
.....	5,893	4	72	0	76	5,817	1.307
.....	5,981	6	104	0	110	5,871	1.319
.....	6,181	4	55	0	59	6,122	1.375
.....	6,408	5	77	0	82	6,326	1.421
.....	7,301	7	20	0	27	7,274	1.634
.....	7,524	8	10	0	18	7,506	1.686
.....	7,990	6	55	0	61	7,929	1.781
.....	8,390	6	142	0	148	8,242	1.851
.....	8,406	6	8	0	14	8,392	1.885
.....	8,458	7	16	0	23	8,435	1.895
.....	8,782	5	9	0	14	8,768	1.969
.....	10,181	5	209	34	248	9,933	2.231
.....	10,697	6	45	0	51	10,646	2.391
.....	10,896	5	28	0	33	10,863	2.440
.....	11,531	6	72	8	86	11,445	2.571
.....	12,315	7	248	96	351	11,964	2.687
.....	13,675	5	79	0	84	13,591	3.053
.....	13,936	7	136	27	170	13,766	3.092
.....	16,669	9	214	58	281	16,388	3.681
.....	22,983	6	175	0	181	22,802	5.122
.....	23,646	6	127	34	167	23,479	5.274
52 weeks)...	325,767	297	2,532	325	3,154	322,613	72.466
average....	6,255	6	49	6	61	6,204	1.393

PEMIGEWASSET RIVER AT PLYMOUTH, N. H.

This station was established September 5, 1903. It is locate at the wooden highway bridge below the mouth of Bakers River i the town of Plymouth. The height of water at Plymouth has bee recorded daily since January 1, 1886, during which time extensiv deforestation in the basin above has taken place. This record of gag height has been given to the United States Geological Survey by th Locks and Canals Company, of Lowell, Mass. The conditions at th station and the bench marks are described in the New Hampshir Forestry Reports for 1903–1906, and in Water-Supply Paper No. 165 page 98, where are given also references to publications that contai data for previous years.

Discharge measurements of Pemigewasset River at Plymouth, N. H., in 1905-6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
July 4	Murphy and Barrows	202	777	3.94	[illegible]
August 3 [a]	H. K. Barrows	178	387	2.75	[illegible]
August 23 [b]	T. W. Norcross	124	257	1.80	[illegible]
September 5	do	224	1,400	6.88	[illegible]
October 7 [a]	do	142	282	2.01	[illegible]
October 28 [a]	do	113	208	1.51	[illegible]
October 28 [a]	do	113	208	1.57	[illegible]
1906.					
April 17	C. R. Adams	228	1,770	8.36	[illegible]
April 17	do	228	1,590	7.56	[illegible]
April 28	T. W. Norcross	212	813	4.00	[illegible]
July 21	G. M. Brett	168	312	1.69	[illegible]
August 24 [a]	do	106	181	1.42	[illegible]
September 29 [a]	F. E. Pressey	102	174	1.42	[illegible]
October 9 [a]	do	108	194	1.60	[illegible]

[a] In left channel by wading.
[b] In left channel by wading; meter fastened to a rod.

Daily gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.4	3.0	3.4	3.1	4.8	4.4	3.35	2.8	1.6	1.3	2.2	[illegible]
2	3.2	2.9	3.55	2.9	4.8	4.05	2.9	2.4	1.55	1.35	2.1	[illegible]
3	2.85	2.8	2.8	3.0	4.9	4.1	2.6	2.2	1.5	1.4	1.9	[illegible]
4	2.9	3.15	2.75	3.3	5.2	3.7	2.65	2.1	1.6	1.35	1.9	[illegible]
5	3.5	3.45	2.8	3.55	4.9	3.4	3.3	1.95	1.7	1.2	1.9	[illegible]
6	3.5	3.55	2.9	4.7	4.7	3.85	2.8	1.85	1.55	1.2	1.85	[illegible]
7	3.2	3.4	2.7	3.7	4.45	5.8	2.45	1.8	1.5	1.1	1.8	[illegible]
8	2.9	3.5	2.5	3.35	4.1	4.7	2.3	1.7	1.5	1.2	1.8	[illegible]
9	2.8	3.5	2.35	3.3	4.4	4.75	2.2	1.75	1.45	1.3	1.8	[illegible]
10	3.0	3.7	2.25	3.1	6.6	4.0	2.3	1.7	1.5	2.6	1.8	[illegible]
11	3.0	3.6	2.2	3.1	5.0	3.85	2.2	1.7	1.4	2.6	1.9	[illegible]
12	3.1	3.4	2.1	3.25	4.6	3.4	2.1	1.7	1.4	2.15	1.9	[illegible]
13	2.85	3.4	2.2	3.35	6.2	3.15	2.0	1.65	1.5	1.95	2.0	[illegible]
14	3.05	3.35	2.15	4.15	5.5	3.0	1.9	1.7	1.5	1.75	1.9	[illegible]
15	2.8	3.3	2.4	9.0	4.5	2.75	1.85	1.6	1.45	1.65	1.85	[illegible]
16	2.85	3.2	2.15	12.35	4.3	2.6	1.8	1.55	1.5	1.65	1.8	[illegible]
17	3.05	3.15	2.0	8.35	4.5	2.65	1.9	1.5	1.4	1.5	1.8	[illegible]
18	2.9	3.15	1.9	7.8	5.85	3.7	2.1	1.5	1.4	1.6	1.75	[illegible]
19	2.8	3.1	2.3	6.9	5.05	3.2	1.9	1.45	1.4	1.6	2.1	[illegible]
20	2.7	3.1	2.2	6.6	4.2	2.8	1.8	1.4	1.3	1.8	3.25	[illegible]

[a] About one-half of section frozen over; open under gage and around pier.
[b] Almost frozen over at gage.

ly gage height, in feet, of Pemigewasset River at Plymouth, N. H., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.75	3.0	2.0	7.1	3.7	2.55	1.8	1.45	1.3	3.2	2.8	2.35
.....	3.25	3.1	1.9	7.2	3.5	2.4	2.8	1.5	1.25	2.5	2.7	2.7
.....	6.05	3.6	1.85	6.2	3.2	2.7	2.2	1.4	1.3	2.2	2.55	[a] 2.7
.....	10.75	3.3	1.7	4.95	3.3	5.1	1.9	1.5	1.4	1.95	2.4	.....
.....	6.25	3.1	1.85	4.25	3.9	3.8	1.9	1.6	1.3	2.3	2.3	.....
.....	4.75	2.9	1.9	4.0	4.2	3.5	1.8	1.5	1.3	4.25	2.2	.....
.....	4.25	3.35	1.95	4.0	5.6	2.85	1.7	1.55	1.3	3.0	2.45	.....
.....	3.75	3.2	2.6	4.05	11.45	2.6	1.7	3.65	1.3	2.7	2.9	[b] 1.4
.....	3.35	.....	3.8	3.9	9.75	2.55	1.7	2.3	1.4	2.5	2.6	.....
.....	2.9	.....	4.1	4.35	6.6	2.8	2.7	1.8	1.3	2.3	2.0	.....
.....	3.1	.....	3.8	.....	5.2	.....	4.2	1.7	.....	2.25	.....	.....

[a] Gage-height to top of ice, open channel 10 feet wide near pier.
[b] River entirely frozen over; gage height to top of ice 1.5 feet.

OTE.—The following ice conditions prevailed during 1906: River frozen over part of time in left nnel only, January 1 to 23; ice went out January 23. During February left channel near gage was en over, right channel near gage was open for a width of about 70 feet; open-water strip extended ream nearly to Bakers River, and some 500 feet downstream from gage. During March the open-r strip in right channel narrowed down to 60 feet width and extended but a short distance above below the gage. Ice began to wear away again about March 24, and went out completely during norning of April 6. River commenced to freeze from the sides about December 1, the ice gradually ding toward the middle until December 28, when the river was entirley frozen. Until December was open under the gage.

uring the frozen season gage readings are to water surface, the gage being over the right channel, h remained open. The average thickness of ice for the left channel and for the frozen portion the gage upstream and downstream was as follows:

Thickness of ice.

Date.	Thickness of ice.	Date.	Thickness of ice.
	Feet.		*Feet.*
ruary 7	0.3	March 17	1.1
ruary 17	.7	December 8	.3
ruary 24	.7	December 23	.9
rch 3	.9	December 28	.8
rch 10	.9		

Rating table for Pemigewasset River at Plymouth, N. H., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.10	140	2.40	720	3.70	1,830	6.00	4,590
1.20	158	2.50	790	3.80	1,930	6.20	4,890
1.30	183	2.60	865	3.90	2,030	6.40	5,200
1.40	211	2.70	945	4.00	2,130	6.60	5,520
1.50	243	2.80	1,025	4.20	2,340	6.80	5,850
1.60	278	2.90	1,105	4.40	2,555	7.00	6,185
1.70	317	3.00	1,190	4.60	2,780	8.00	7,970
1.80	361	3.10	1,275	4.80	3,010	9.00	9,970
1.90	410	3.20	1,365	5.00	3,250	10.00	12,050
2.00	465	3.30	1,455	5.20	3,500	11.00	14,150
2.10	525	3.40	1,545	5.40	3,760	12.00	16,250
2.20	585	3.50	1,640	5.60	4,030	13.00	18,350
2.30	650	3.60	1,735	5.80	4,305		

OTE.—The above table is applicable only for open-channel conditions. It is based on discharge asurements made during 1905–6 and is well defined.

Monthly discharge of Pemigewasset River at Plymouth, N. H., for 1905–6.

[Drainage area, 615 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inches.
1905.					
April	7,140	1,500	3,180	5.18	
May	3,440	865	1,690	2.74	
June	5,040	650	1,280	2.07	
July	4,590	317	920	1.50	
August	2,500	317	702	1.14	
September	9,570	790	2,460	4.00	
October	2,030	386	732	1.19	
November	3,250	361	687	1.12	
December	5,040	361	1,470	2.39	
1906.					
April (6–30)	17,000	1,280	4,180	6.80	
May	15,100	1,360	3,700	6.01	
June	4,300	720	1,700	2.76	
July	2,340	317	688	1.12	
August	1,780	211	394	.641	
September	317	170	222	.361	
October	2,390	140	542	.881	
November	1,410	339	573	.932	

NOTE. Values for 1905 and 1906 are excellent.

CONTOOCOOK RIVER AT WEST HOPKINTON, N. H.

This station was established July 9, 1903. It is located at wooden highway bridge near the railway station at West Hopkint The conditions and the bench marks are described in Water-Sup Paper No. 165, page 101, where are given also references to publ tions that contain data for previous years. Length of chain, A 27, 1906, 26.02 feet.

Discharge measurements of Contoocook River at West Hopkinton, N. H., in 1906

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Di chai
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
April 27	T. W. Norcross	124	320	3.97	
July 19	G. M. Brett	120	230	3.22	

Daily gage height, in feet, of Contoocook River at West Hopkinton, N. H., for 19

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.55	3.5	3.5	5.05	3.6	5.55	3.7	3.25	2.5	2.3	2.75
2	3.55	3.6	3.5	4.6	3.6	4.8	4.1	3.15	2.4	2.3	2.65
3	3.4	3.5	3.5	4.3	3.85	4.5	4.0	2.85	2.4	2.35	2.6
4	3.6	3.5	3.4	4.2	4.0	4.3	3.9	2.85	2.3	2.3	2.55
5	3.8	3.3	3.65	4.65	3.9	3.9	4.4	2.8	2.3	2.2	2.6
6	3.75	3.5	3.6	5.2	3.7	3.7	4.1	2.85	2.3	2.2	2.5
7	3.7	3.4	3.6	5.2	3.7	3.6	3.7	2.85	2.3	2.3	.....
8	3.8	3.5	3.55	5.0	3.8	3.65	3.4	2.9	2.3	2.3	.....
9	3.7	3.6	3.55	4.75	3.8	3.8	3.3	2.8	2.3	2.3	2.55
10	3.7	3.3	3.5	4.5	3.95	3.9	3.2	2.75	2.2	2.65	2.5
11	3.75	3.3	3.45	4.4	4.0	3.95	3.2	2.7	2.2	2.95	2.5
12	3.9	3.65	3.4	5.0	3.8	3.8	3.2	2.65	2.3	2.85	2.6
13	4.05	3.9	3.35	5.3	3.7	3.6	3.15	2.6	2.2	2.8	2.85
14	4.0	3.75	3.2	5.75	3.6	3.4	3.0	2.5	2.3	2.7	2.85
15	3.65	3.6	3.3	6.9	3.5	3.2	2.9	2.45	2.3	2.5	2.8

[a] Anchor ice in river.

y gage height, in feet, of Contoocook River at West Hopkinton, N. H., for 1906—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	3.6	3.65	3.1	8.4	3.4	3.1	2.8	2.5	2.2	2.4	2.7	3.95
.....	3.8	3.75	3.05	8.0	3.45	3.55	2.85	2.4	2.3	2.3	2.75	3.85
.....	3.75	3.8	3.0	6.55	3.6	4.8	2.95	2.5	2.25	2.35	2.7	3.75
.....	3.7	3.9	2.9	5.8	3.5	5.0	3.15	2.4	2.2	2.4	3.2	3.7
.....	3.6	3.8	3.0	5.35	3.4	4.65	3.1	2.5	2.3	2.55	4.1	3.6
.....	3.5	3.9	3.1	5.05	3.3	4.1	3.05	2.4	2.3	2.85	4.0	3.55
.....	3.8	4.1	3.0	4.85	3.2	3.75	3.0	2.4	2.3	2.8	3.9	3.5
.....	6.0	4.0	3.05	4.65	3.1	3.5	2.95	2.4	2.3	2.95	3.85	3.5
.....	7.3	3.8	3.0	4.6	3.1	4.0	3.0	2.7	2.3	2.8	3.5	3.45
.....	6.3	3.9	3.05	4.3	3.4	4.7	3.1	2.65	2.3	2.9	3.3	3.5
.....	4.9	3.75	2.9	4.15	3.6	4.1	2.9	2.6	2.35	2.85	3.0	3.6
.....	4.6	3.7	3.45	3.95	3.75	3.6	2.85	2.6	2.3	3.05	2.95	3.45
.....	4.1	3.5	5.3	3.8	6.3	3.4	2.8	.....	2.3	2.9	3.05	3.4
.....	3.8	.....	5.4	3.8	7.65	3.3	2.75	.....	2.35	2.8	3.0	3.4
.....	3.6	.....	5.5	3.6	7.65	3.25	2.8	.....	2.3	2.8	3.0	3.5
.....	3.6	.....	5.2	.....	7.0	.....	2.95	2.5	.....	2.85	.....	3.55

TE.—During the winter months considerable trouble is experienced from anchor ice forming around and forming backwater.

Rating table for Contoocook River at West Hopkinton, N. H., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.20	143	3.40	651	4.60	1,805	6.60	4,694
2.30	165	3.50	724	4.70	1,925	6.80	5,022
2.40	185	3.60	801	4.80	2,045	7.00	5,350
2.50	209	3.70	882	4.90	2,165	7.20	5,678
2.60	237	3.80	967	5.00	2,290	7.40	6,006
2.70	270	3.90	1,056	5.20	2,550	7.60	6,334
2.80	308	4.00	1,150	5.40	2,820	7.80	6,662
2.90	352	4.10	1,250	5.60	3,100	8.00	6,990
3.00	402	4.20	1,355	5.80	3,395	9.00	8,630
3.10	457	4.30	1,465	6.00	3,710		
3.20	517	4.40	1,575	6.20	4,038		
3.30	582	4.50	1,690	6.40	4,366		

TE.—The above table is applicable only for open-channel conditions. It is based on twelve dis-ge measurements made during 1905–6 and is well defined between gage heights 2.4 feet and 9.0 feet.

Monthly discharge of Contoocook River at West Hopkinton, N. H., for 1906.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	7,650	801	2,500	6.10	6.81
.....	6,420	457	1,430	3.49	4.02
.....	3,030	457	1,170	2.85	3.18
.....	1,580	289	583	1.42	1.64
ist.....	550	185	265	.646	.74
mber.....	209	143	164	.400	.45
ber.....	430	143	254	.620	.72
mber.....	1,250	209	429	1.05	1.17

TE.—Values are rated as follows: September, good; remainder of the period, excellent.

SUDBURY RIVER AT FRAMINGHAM AND LAKE COCHITUATE AT COCHITUATE, MASS.

Sudbury River and Lake Cochituate have been studied by the engineers of the city of Boston, the State board of health of Massachusetts, and the metropolitan water and sewerage board; records of rainfall in the Sudbury basin have been kept since 1875 and in the Cochituate basin since 1852, but the latter are considered of doubtful accuracy previous to 1872.

The conditions at this station and the bench marks are described in Water-Supply Paper No. 165, page 104, where are given also references to publications that contain data for previous years.

The accompanying tables, furnished by Frederic P. Stearns, give the results for 1906, also the averages for thirty-two years for Sudbury River and for forty-four years for Lake Cochituate.

Yield and rainfall in Sudbury River watershed at Framingham, Mass.

[Drainage area, 75.2 square miles.]

Month.	Total yield in million gallons.	Average yield of 1 square mile.		Rainfall in inches.[a]	Rainfall collected in inches.[a]	Per cent collected.
		Million gallons per day.	Second-feet.			
1906.						
January	2,629.5	1.128	1.745	2.47	2.012	81.5
February	2,190.9	1.041	1.610	2.92	1.676	57.5
March	5,615.7	2.409	3.727	6.32	4.297	68.1
April	4,396.1	1.949	3.015	2.88	3.364	116.8
May	2,469.5	1.059	1.639	5.66	1.890	33.4
June	1,594.0	.707	1.093	3.91	1.220	31.2
July	927.0	.398	.615	3.42	.709	20.7
August	420.0	.180	.279	3.02	.321	10.6
September	43.9	.019	.030	3.30	.034	1.0
October	702.8	.301	.466	3.40	.538	15.8
November	1,089.6	.483	.747	2.69	.834	31.1
December	1,535.4	.659	1.019	4.49	1.175	26.2
The year	23,614.4	.860	1.331	44.48	18.070	40.6
1875–1906.						
January	91,014.7	1.220	1.888	4.19	2.176	52.0
February	121,403.4	1.788	2.766	4.22	2.903	68.7
March	220,293.6	2.953	4.569	4.60	5.268	114.5
April	151,296.9	2.096	3.242	3.56	3.618	101.7
May	82,987.5	1.113	1.721	3.35	1.984	59.2
June	37,975.4	.526	.814	3.17	.908	28.6
July	14,853.9	.199	.308	3.72	.355	9.5
August	21,025.6	.282	.436	3.98	.503	12.6
September	18,971.7	.263	.407	3.43	.454	13.2
October	36,465.7	.489	.756	4.12	.872	21.2
November	60,496.0	.838	1.296	3.86	1.446	37.5
December	79,300.3	1.063	1.645	3.84	1.896	49.3
The period	936,084.7	1.065	1.648	46.04	22.384	48.6

[a] Total for month for 1906; average of totals per calendar month 1875 to 1906.

Yield and rainfall in Cochituate Lake watershed at Cochituate, Mass.

[Drainage area, 18.87 square miles.]

Month.	Total yield in million gallons.	Average yield of 1 square mile.		Rainfall in inches.[a]	Rainfall collected in inches.[a]	Per cent collected.
		Million gallons per day.	Second-feet.			
1906.						
.....	515.2	0.881	1.363	2.66	1.57	59.0
.....	418.5	.792	1.226	2.59	1.28	49.3
.....	1,140.7	1.950	3.017	6.47	3.48	53.8
.....	873.9	1.544	2.388	2.60	2.66	102.5
.....	527.5	.902	1.395	4.98	1.61	32.3
.....	282.3	.499	.772	3.44	.86	25.0
.....	241.9	.414	.640	3.04	.74	24.3
.....	185.3	.317	.490	2.37	.57	23.8
.....	156.8	.277	.429	2.84	.48	16.8
.....	279.2	.477	.738	3.26	.85	26.1
.....	264.0	.466	.722	2.50	.80	32.2
.....	266.5	.456	.705	4.68	.81	17.4
ar.....	5,151.8	.748	1.157	41.43	15.71	37.9
1863–1906.						
.....	28,826.8	1.120	1.733	3.95	2.00	50.6
.....	36,490.5	1.532	2.371	3.95	2.53	64.8
.....	57,206.9	2.222	3.438	4.47	3.97	88.7
.....	42,941.9	1.724	2.667	3.65	2.97	81.5
.....	25,244.0	.980	1.516	3.71	1.75	47.2
.....	11,642.5	.467	.723	3.08	.81	26.2
.....	7,639.5	.297	.459	1.09	.53	13.0
.....	10,871.0	.422	.653	4.32	.75	17.4
.....	10,791.4	.433	.670	3.57	.75	20.9
.....	14,836.4	.576	.892	4.31	1.03	23.9
.....	20,070.4	.806	1.247	4.09	1.39	34.0
.....	24,446.7	.950	1.469	3.58	1.69	47.3
riod.....	290,988.0	.959	1.485	46.77	20.17	43.1

[a] Total per month for 1905; average of totals per calendar month 1863–1906.

OUTH BRANCH OF NASHUA RIVER AT CLINTON, MASS.

July, 1896, the flow of South Branch of Nashua River has asured at Clinton by the engineers of the metropolitan water erage board. The results of these measurements have been l by Frederic P. Stearns, chief engineer. Beginning with flow has been corrected for loss and gain of storage in ponds reservoirs on the watershed, so that the results show the flow of the stream. The accompanying tables give the or 1906, also the average for the years 1897–1906, inclusive. litions at the station and the bench marks are described in upply Paper No. 165, page 108, where are given also refer- publications that contain data for previous years.

Yield and rainfall in South of Branch Nashua River watershed at Clinton, Mass.

[Drainage area, 119 square miles.]

Month.	Total yield in million gallons.	Average yield of 1 square mile.		Rainfall in inches.[a]	Rainfall collected in inches.[a]	Per cent collected.
		Million gallons per day.	Second-feet.			
1906.						
January	4,174.7	1.132	1.751	2.59	2.018	78.1
February	3,420.3	1.027	1.588	2.74	1.654	60.5
March	6,961.7	1.860	2.878	5.17	3.317	64.2
April	7,528.2	2.109	3.263	3.12	3.640	116.5
May	5,654.2	1.533	2.371	6.58	2.734	41.5
June	4,225.4	1.184	1.831	5.95	2.043	34.3
July	2,686.3	.728	1.127	5.52	1.299	23.5
August	2,180.8	.591	.915	4.34	1.055	24.3
September	966.6	.277	.428	2.61	.478	18.3
October	1,954.9	.530	.820	3.95	.945	23.9
November	2,675.6	.749	1.160	2.25	1.294	57.5
December	2,930.7	.794	1.229	4.26	1.417	33.3
The year	45,281.4	1.043	1.613	49.08	21.894	44.6
1897–1906.						
January	43,398.4	1.177	1.820	3.76	2.098	55.8
February	46,781.4	1.399	2.164	3.75	2.262	60.3
March	111,969.4	3.035	4.696	4.94	5.413	109.6
April	88,208.7	2.471	3.822	4.17	4.265	102.2
May	46,487.3	1.260	1.949	3.50	2.248	64.2
June	32,706.7	.916	1.417	4.60	1.582	34.4
July	19,658.7	.533	.825	4.64	.851	20.5
August	19,194.2	.520	.805	4.43	.928	21.1
September	15,590.1	.437	.675	3.78	.754	20.0
October	21,432.1	.581	.899	3.58	1.036	28.9
November	28,836.4	.808	1.249	3.49	1.394	39.9
December	53,683.2	1.455	2.251	4.71	2.596	55.1
The period	527,946.6	1.215	1.880	49.32	25.527	51.8

[a] Total per month for 1906; average of totals per calendar month 1897–1906.

BLACKSTONE RIVER DRAINAGE BASIN.

BLACKSTONE RIVER NEAR WOONSOCKET, R. I.

A gaging station was established on Blackstone River near Woonsocket, R. I., April 5, 1904. During 1905 it was found that the flow was considerably influenced by backwater from the dam at Woonsocket, and the station was discontinued December 31, 1905. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 109, where are given also references to publications that contain data for previous years.

CONNECTICUT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Connecticut River has its source in Connecticut Lake in northern New Hampshire. Its extreme headwaters, however, lie in the Province of Quebec and in the mountains on the northern boundary of New Hampshire; thence the river flows in a southerly direction between New Hampshire and Vermont and through Massachusetts and Connecticut into Long Island Sound. The total drainage area is 11,085 square miles, of which 155 square miles lie in the Province of Quebec

Its total length from Connecticut Lake to Long Island Sound is 345 miles. Water power is used at several points, notably at Windsor Locks, Conn.; Holyoke and Turners Falls, Mass.; and Bellows Falls and Wilder, Vt.

The drainage areas of the river and of several of its tributaries are given in Water-Supply Paper No. 165, page 114.

CONNECTICUT RIVER NEAR ORFORD, N. H.

This station was established August 6, 1900. It is located at the wooden highway bridge between Orford, N. H., and Fairlee, Vt., and is about 75 miles from the source of the stream. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 115, where are given also references to publications that contain data for previous years. Length of chain changed October 4, 1906, to 42.80 feet, owing to movement of bridge to which it is attached.

Discharge measurements of Connecticut River near Orford, N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.[a]	Gage height.[b]	Thickness of ice.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Feet.*	*Feet.*	*Sec.-ft.*
February 8	T. W. Norcross	327	1,920	6.84	6.99	1.48	2,250
February 15	Norcross and Adams	327	1,870	6.80	6.80	1.48	2,240
February 17	do	327	1,790	6.56	6.58	1.52	2,040
March 14	Barrows and Norcross	327	1,560	6.00	6.11	1.55	1,680
March 15	T. W. Norcross	327	1,440	5.59	5.70	1.55	1,490

[a] To water surface. [b] To top of ice.

Daily gage height, in feet, of Connecticut River near Orford, N. H., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	[a]8.0	9.8	.....	[a]11.3	9.3	13.9	6.5	5.5	4.5	2.8	5.6	5.6
2	[a]11.0	8.7	.....	[a]10.1	9.9	12.3	6.5	5.5	3.9	2.9	5.5	5.5
3	[a]12.7	7.8	.....	[a]9.9	12.4	10.6	6.3	5.5	4.2	3.1	4.8	5.3
4	[a]11.3	[a]7.7	6.8	[a]9.5	13.9	9.3	5.9	4.5	6.1	3.8	4.5	5.0
5	[a]9.2	[a]7.4	.....	[a]11.7	13.7	9.9	6.1	3.9	5.8	3.9	4.5	5.0
6	[a]8.1	.....	.....	[a]11.9	13.0	9.8	6.2	4.3	5.5	3.6	4.3	4.8
7	[a]7.4	.....	.....	[a]12.7	12.8	10.7	5.9	3.7	4.9	3.1	4.2	4.7
8	.....	6.85	.....	[a]11.9	12.5	11.4	5.5	3.6	4.5	3.1	4.0	4.2
9	.....	.....	6.4	[a]11.3	11.6	12.3	5.4	3.9	4.3	3.4	3.9	4.3
10	.....	7.1	.....	[a]11.1	13.3	11.9	4.9	3.9	4.3	4.2	3.7	4.3
11	.....	.....	6.4	[a]10.5	14.1	10.8	5.5	3.6	3.6	4.3	3.9	4.4
12	[a]5.9	7.0	.....	[a]9.9	13.7	9.4	5.5	3.1	3.9	5.8	4.0	4.5
13	.....	.....	.....	[a]9.8	13.1	8.9	5.6	3.5	4.0	6.6	3.7	.....
14	5.9	.....	6.0	[a]9.8	15.7	8.5	5.1	3.1	3.5	6.2	4.0	.....
15	.....	6.8	5.6	14.8	16.2	7.9	4.9	3.2	3.4	5.7	4.3	.....
16	.....	.....	.....	21.4	15.4	7.4	5.0	2.9	3.3	5.1	4.5	[a]4.8
17	.....	.....	.....	21.6	16.4	6.8	4.5	3.0	3.5	4.9	4.0	.....
18	.....	6.6	5.7	21.4	16.6	6.4	4.3	3.1	3.3	4.5	3.7	.....
19	.....	.....	.....	20.2	13.7	6.1	4.0	3.2	3.2	4.6	5.0	.....
20	.....	.....	.....	19.1	13.1	5.8	4.0	3.4	3.0	4.1	5.7	.....
21	5.9	.....	.....	18.4	12.3	6.2	3.9	2.9	2.7	5.1	6.4	.....
22	[a]6.9	.....	.....	18.7	11.3	6.5	4.5	3.0	2.8	5.4	7.1	.....
23	[a]10.0	.....	.....	17.9	10.1	6.9	5.1	2.9	2.7	6.3	6.7	[a]5.0
24	17.7	.....	.....	15.4	9.8	7.2	4.8	3.0	2.9	6.7	6.4	.....
25	20.2	8.4	5.2	13.7	9.4	6.9	4.4	2.9	3.0	6.6	6.1	.....

[a] To top of ice.

Daily gage height, in feet, of Connecticut River near Orford, N. H., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	19.0	.....	.....	11.6	12.0	6.7	4.0	3.3	2.9	6.9	6.3	.....
27	17.4	.....	.....	10.9	13.2	6.4	4.5	4.5	2.8	7.4	6.3	.....
28	14.9	.....	.....	10.5	18.6	6.2	4.5	6.5	2.8	7.2	6.4	.....
29	12.7	.....	[a] 11.6	9.9	20.4	5.9	4.0	6.0	2.9	6.9	6.5	.....
30	11.2	.....	[a] 12.0	9.4	16.9	6.0	4.6	5.9	2.8	6.7	5.9	[illegible]
31	10.4	.....	[a] 12.1	.....	15.8	.....	5.2	5.0	.....	6.7	.....	.....

[a] To top of ice.

NOTE. The following ice conditions prevailed during 1906: River frozen over January 1 to 23; ice went out January 24. Frozen over at gage February 3; right channel open about 100 feet wide; left channel frozen over; river entirely covered with ice above the bridge. River entirely frozen over at gage about March 1; ice went out about April 15. River frozen over December 12 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 14	5.9	6.1	0.7	March 9	6.4	6.5	.....
January 21	5.9	5.9	.8	March 11	6.4	6.5	1.5
February 8	6.85	7.0	1.5	March 14	6.0	6.1	1.5
February 15	6.8	6.85	1.5	March 15	5.6	5.7	1.5
February 18	6.6	6.6	1.5	March 18	5.7	5.9	1.6
February 25	8.4	8.6	1.5	March 25	5.2	5.4	1.7
March 4	6.8	6.9	1.5	December 30	4.8	4.9	.7

Rating table for Connecticut River near Orford, N. H.

FOR OPEN-CHANNEL CONDITIONS FROM 1904 TO 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.70	950	4.20	1,880	5.70	3,170	10.00	8,250
2.80	1,000	4.30	1,950	5.80	3,270	11.00	9,700
2.90	1,050	4.40	2,030	5.90	3,370	12.00	11,200
3.00	1,100	4.50	2,110	6.00	3,470	13.00	12,770
3.10	1,160	4.60	2,190	6.20	3,680	14.00	14,340
3.20	1,220	4.70	2,270	6.40	3,900	15.00	15,910
3.30	1,280	4.80	2,350	6.60	4,120	16.00	17,480
3.40	1,340	4.90	2,430	6.80	4,340	17.00	19,050
3.50	1,400	5.00	2,520	7.00	4,560	18.00	20,620
3.60	1,460	5.10	2,610	7.20	4,780	19.00	22,190
3.70	1,530	5.20	2,700	7.40	5,000	20.00	23,760
3.80	1,600	5.30	2,790	7.60	5,220	21.00	25,330
3.90	1,670	5.40	2,880	7.80	5,440	22.00	26,900
4.00	1,740	5.50	2,970	8.00	5,660		
4.10	1,810	5.60	3,070	9.00	6,900		

UNDER ICE COVER FOR 1906.[b]

3.60	1,210	4.60	1,740	5.60	2,400	6.60	3,140
3.80	1,300	4.80	1,860	5.80	2,540	6.80	3,300
4.00	1,400	5.00	1,990	6.00	2,680	7.00	3,460
4.20	1,500	5.20	2,120	6.20	2,830	8.00	4,290
4.40	1,620	5.40	2,260	6.40	2,980		

[a] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1900-1906, and is well defined below gage height 12 feet. Above gage height 12 feet the rating curve is a tangent, the difference being 157 per tenth.

[b] This table is applicable only for ice-cover conditions. It is based upon fourteen discharge measurements made during 1904-1906, and is well defined between gage heights 4 feet and 5.5 feet. Gage heights are to bottom of ice. Above gage height 8 feet 75 per cent of the open-channel rating was used

Monthly discharge of Connecticut River near Orford, N. H., for 1906.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile	Depth in inches.
.....	21,600	2,055	6,360	1.93	2.22
y.....	7,170	2,055	3,030	.918	.96
.....	6,800	1,255	2,240	.679	.78
.....	26,300	4,300	11,800	3.58	3.99
.....	24,400	7,290	13,700	4.15	4.78
.....	14,200	3,270	6,540	1.98	2.21
.....	4,010	1,670	2,630	.797	.92
.....	4,010	1,050	1,790	.542	.62
ber.....	3,570	950	1,600	.485	.54
.....	5,000	1,000	2,760	.836	.96
ber.....	4,670	1,530	2,670	.809	.90
er.....	3,070	1,500	1,960	.594	.68
he year.....	26,300	950	4,760	1.44	19.56

.—Values are rated as follows: January to March and December, fair; April, good; May to ber, excellent.

CONNECTICUT RIVER AT SUNDERLAND, MASS.

is station was established March 31, 1904. It is located at a pan steel highway bridge, with a total length of about 830 feet, nderland. The nearest railway station is at South Deerfield. gaging station is about 18 miles above the dam at Holyoke and t 5 miles below that at Turners Falls. The conditions at the n and the bench marks are described in Water-Supply Paper 65, page 118, where are given also references to publications that in data for previous years. Length of chain changed to 42.84 n April 24, 1906.

Discharge measurements of Connecticut River at Sunderland, Mass., in 1906.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	T. W. Norcross.....	776	10,700	14.54	40,400
9.....	G. M. Brett.....	692	2,830	4.04	5,320
6.....	F. E. Pressey.....	563	1,435	2.05	2,030

aily gage height, in feet, of Connecticut River at Sunderland, Mass., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	8.2	7.4	8.75	10.45	9.35	13.15	6.0	5.3	4.1	2.45	4.2	5.0
.....	7.9	7.1	7.7	9.4	9.35	10.9	8.0	5.25	3.55	2.0	4.1	4.75
.....	7.05	8.0	7.25	8.5	10.5	9.4	7.75	4.9	3.3	2.3	3.95	4.2
.....	6.75	6.9	10.0	8.5	11.8	9.0	7.3	5.0	3.0	2.5	3.8	4.8
.....	7.2	7.25	11.45	9.8	11.4	8.7	7.0	5.0	2.9	2.35	3.6	4.75
.....	7.5	7.4	9.85	11.4	10.6	8.2	6.7	4.55	3.2	2.2	3.65	4.7
.....	7.25	.....	8.7	11.8	10.35	8.1	6.1	4.3	3.4	1.6	3.45	4.7
.....	7.05	.....	7.95	10.7	10.25	8.6	5.5	4.35	3.3	2.55	3.4	4.85
.....	6.85	.....	7.75	10.0	9.8	9.9	5.1	4.05	3.2	2.45	3.3	.....
.....	6.7	.....	7.1	9.6	11.1	10.2	4.75	3.65	3.2	2.7	3.25	.....
.....	6.5	.....	5.8	9.4	12.1	10.0	4.8	3.35	3.0	2.75	3.1	.....
.....	6.55	.....	5.4	10.2	11.7	9.4	4.8	3.3	2.8	3.0	3.2	.....
.....	7.15	.....	4.9	11.5	10.9	8.6	4.85	3.2	2.9	2.9	3.5	.....
.....	7.5	.....	4.85	12.5	11.0	7.7	4.75	3.1	2.7	3.2	3.6	.....
.....	7.25	.....	5.0	16.2	12.1	7.0	4.4	3.1	2.65	3.8	3.6	4.6

Daily gage height, in feet, of Connecticut River at Sunderland, Mass., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Jnly.	Aug.	Sept.	Oct	Nov.	Dec.
16	7.2	.....	6.05	23.1	11.8	6.2	4.1	3.05	2.25	3.9	3.6	.....
17	7.6	6.6	6.4	22.8	11.2	5.9	3.75	3.05	2.6	3.55	3.45	.....
18	7.6	.....	5.3	21.0	10.55	6.5	4.3	2.8	2.3	3.3	3.45	.....
19	7.5	.....	4.45	19.65	9.85	7.6	4.9	2.3	2.45	3.2	4.5	.....
20	7.1	.....	5.6	18.85	9.3	7.5	4.5	2.5	2.4	3.35	6.5	.....
21	6.9	.....	6.0	17.9	9.1	6.8	4.0	2.25	2.4	4.75	6.8	.....
22	7.1	.....	4.9	16.9	8.8	6.1	3.9	2.6	2.55	4.5	6.9	4.6
23	10.75	.....	4.25	16.3	8.2	5.5	4.4	3.35	2.3	4.5	7.0	.....
24	15.55	.....	4.0	15.7	7.55	6.0	4.5	2.8	2.8	4.4	6.75	.....
25	17.6	.....	4.0	14.4	7.05	7.5	4.55	2.8	2.4	4.3	6.2	.....
26	14.3	.....	3.75	12.8	7.25	7.6	4.3	2.5	2.5	4.5	5.55	.....
27	12.6	10.6	4.1	11.1	8.0	7.1	3.95	2.9	2.55	4.7	5.4	.....
28	11.35	9.8	7.7	10.5	15.4	6.4	3.65	2.85	2.45	5.0	5.45	.....
29	10.2	.....	10.4	9.45	21.1	5.95	3.65	2.9	2.35	5.0	5.45	4.3
30	8.65	.....	10.9	9.2	19.75	5.4	4.1	4.2	1.85	4.9	5.5	.....
31	7.7	.....	10.7	.....	16.3	.....	4.7	4.45	.....	4.5	.....	.....

NOTE.—The river froze over February 7 and cleared of ice the afternoon of February 27. On March 8 the river was frozen over, beginning about 500 feet above the gage, but was open at and below the bridge; this ice went out March 28. River frozen December 4 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
February 7	.....	7.3	.....	February 24	.....	9.9	.....
February 10	.....	6.9	.....	December 22	4.8	4.85	0.3
February 17	6.6	6.6	0.7	December 29	4.75	4.8	[illegible]

Rating table for Connecticut River at Sunderland, Mass., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	1,630	3.00	3,350	4.40	6,200	6.60	12,100
1.70	1,710	3.10	3,520	4.50	6,430	6.80	12,710
1.80	1,800	3.20	3,700	4.60	6,670	7.00	13,340
1.90	1,900	3.30	3,880	4.70	6,910	7.20	13,980
2.00	2,000	3.40	4,070	4.80	7,150	7.40	14,630
2.10	2,110	3.50	4,270	4.90	7,400	7.60	15,290
2.20	2,220	3.60	4,470	5.00	7,650	7.80	15,970
2.30	2,330	3.70	4,670	5.20	8,170	8.00	16,650
2.40	2,470	3.80	4,880	5.40	8,690	9.00	20,200
2.50	2,600	3.90	5,090	5.60	9,230	10.00	23,850
2.60	2,740	4.00	5,300	5.80	9,780	11.00	27,550
2.70	2,880	4.10	5,520	6.00	10,340	12.00	31,250
2.80	3,030	4.20	5,740	6.20	10,920	13.00	34,950
2.90	3,190	4.30	5,970	6.40	11,500		

NOTE.—The above table is applicable only for open-channel conditions. It is based on three discharge measurements made during 1906, and the form of previous curves. It is well defined between gage heights 2 feet and 20 feet. Above gage height 9.5 feet the rating curve is a tangent, the difference being 370 per tenth.

Monthly discharge of Connecticut River at Sunderland, Mass., for 1906.

[Drainage area, 7,700 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ril	72,300	18,400	36,100	4.69	5.23
y	64,900	13,500	27,800	3.61	4.16
e	35,500	8,690	16,600	2.16	2.41
y	16,600	4,570	7,880	1.02	1.18
gust	8,430	2,280	4,540	.590	.68
tember	5,520	1,850	3,070	.399	.45
tober	7,650	1,630	4,430	.575	.66
vember	13,300	3,520	6,820	.886	.99

NOTE.—Values are rated as follows: April, good; May to November, excellent.

CONNECTICUT RIVER AT HARTFORD, CONN.

Daily readings of the height of water at Hartford have been corded since February 8, 1896, by Edwin Dwight Graves, chief gineer of the Connecticut River bridge and highway district, and rough his courtesy have been furnished to the United States ological Survey.

The conditions at this station and the bench marks are described Water-Supply Paper No. 165, page 121, where are given also ferences to publications that contain data for previous years.

Daily gage height, in feet, of Connecticut River at Hartford, Conn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	5.4	6.1	5.6	10.8	7.7	15.6	4.1	3.4	2.6	0.7	2.8	3.9
	5.1	5.7	7.0	10.0	7.7	12.3	5.1	3.5	2.0	1.4	2.4	2.7
	5.1	4.0	7.0	8.8	7.8	9.6	6.5	3.3	1.8	1.7	2.5	2.6
	5.6	4.7	10.2	7.7	9.0	8.0	6.6	3.0	1.5	1.8	1.5	1.7
	5.0	4.2	12.0	7.8	9.7	7.4	6.0	3.0	2.0	1.9	2.0	3.0
	5.1	3.7	9.7	9.6	9.1	7.0	5.6	3.1	1.8	1.9	2.7	2.9
	4.3	4.4	7.3	11.0	8.8	6.7	5.2	3.1	1.7	1.4	2.3	2.3
	4.0	4.0	6.1	10.5	8.8	6.7	4.5	3.0	2.0	.8	2.2	3.3
	4.9	4.0	5.5	9.6	8.5	7.0	4.2	3.1	1.8	1.6	2.4	3.2
	5.5	4.1	5.1	10.6	8.4	7.9	3.9	3.0	1.9	2.2	3.0	3.2
	5.5	2.9	4.3	11.4	9.6	8.3	3.7	3.0	2.0	2.5	2.9	4.3
	5.1	3.6	4.5	11.6	10.0	8.0	3.6	2.0	2.6	1.9	3.5	3.7
	5.0	4.2	4.4	11.5	9.5	7.3	3.4	2.2	2.8	2.3	3.5	3.9
	5.5	4.2	4.0	11.5	8.9	6.5	3.3	2.9	2.8	1.9	3.5	3.9
	6.1	4.4	4.0	12.0	9.2	5.7	3.1	2.7	2.2	2.6	3.5	3.7
	6.3	4.0	3.7	17.6	9.7	5.2	3.1	2.6	2.8	3.6	3.3	2.8
	6.6	3.9	3.5	20.0	9.4	4.8	3.1	2.4	1.7	3.2	2.3	2.8
	6.4	3.6	3.9	20.1	8.9	4.8	2.8	1.8	1.6	2.7	1.6	3.9
	6.2	3.7	3.8	19.1	8.3	5.5	2.8	1.2	1.5	2.9	2.2	3.7
	5.7	4.0	4.0	18.0	7.4	6.2	3.1	.8	1.4	2.5	4.5	3.6
	5.0	4.0	2.7	17.1	7.1	5.9	3.0	1.5	1.8	3.2	5.2	3.8
	5.0	5.2	3.8	16.1	7.0	5.2	2.1	2.0	1.7	4.2	5.5	3.8
	5.4	7.2	3.2	15.2	6.6	4.6	2.3	1.9	1.7	3.9	5.2	3.2
	9.0	7.4	2.5	14.5	6.0	4.0	2.9	1.7	1.2	3.8	5.0	3.0
	14.4	6.7	1.8	13.7	5.5	4.5	2.8	1.7	2.2	4.7	4.7	2.8
	14.1	6.9	2.5	12.5	5.2	5.5	2.9	1.8	2.4	4.3	4.4	2.7
	12.0	7.0	3.2	11.1	5.3	5.5	2.9	2.1	2.8	4.5	4.3	3.3
	10.4	6.2	4.7	9.5	7.3	5.1	2.9	2.4	2.4	4.1	4.1	3.2
	9.2	.....	9.6	8.4	15.9	4.6	2.4	2.8	2.8	3.3	3.5	3.3
	8.0	.....	10.8	7.8	19.0	4.3	2.9	3.0	1.8	3.5	4.0	2.6
	6.8	.....	10.8	.....	18.2	.....	3.2	3.0	.....	3.1	.....	2.8

ISRAEL RIVER (ABOVE SOUTH BRANCH) NEAR JEFFERSON HIGH N. H.

This station was established September 2, 1903. It is locat a small wooden highway bridge in the town of Randolph, about way between the railway stations of Jefferson Highland and man, 2½ miles from either place. The conditions and the bench r are described in New Hampshire Forestry Reports for 1903- and in Water-Supply Paper No. 165, page 123, where are given references to publications that contain data for previous y During 1906 gage was read by William Russell. Length of c changed October 1, 1906, to 15.35 feet. Elevation of bench n 8.50 feet above datum of gage.

Discharge measurements of Israel River (above South Branch) near Jefferson Hig N. H., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	I ch
		Feet.	*Sq. ft.*	*Feet.*	*Se*
May 1	T. W. Norcross	25	33	1.83	
August 22	G. M. Brett	9.2	5.0	1.03	
August 22	do	9.2	4.9	1.03	
October 1 [a]	F. E. Pressey	18	12.8	1.13	

[a] By wading about 20 feet above bridge.

Daily gage height, in feet, of Israel River (above South Branch) near Jefferson Hig N. H., for 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Day.	May.	June.	July.	Aug.	Sept.
1	1.73	1.6	1.4	1.15	1.2	1.2	17	1.7	1.4	1.2	1.05	1.15
2	1.6	1.5	1.35	1.1	1.2	1.15	18	2.0	1.5	1.35	1.0	1.15
3	1.95	1.9	1.35	1.05	85	1.15	19	2.25	1.45	1.2	1.0	1.15
4	1.7	1.6	1.45	1.05	5	1.15	20	1.6	1.4	1.15	1.0	1.1
5	2.15	1.9	1.45	1.05	3	1.15	21	1.7	1.35	1.15	1.05	1.1
6	1.8	1.7	1.35	1.05	25	1.1	22	1.6	1.3	1.35	1.05	1.1
7	1.7	2.4	1.3	1.45	2	1.1	23	1.65	1.3	1.3	1.05	1.15
8	1.6	2.0	1.3	1.2	2	1.3	24	1.75	1.6	1.25	1.2	1.1
9	1.5	1.9	1.3	1.15	25	1.15	25	1.75	1.45	1.2	1.1	1.1
10	1.8	1.95	1.3	1.1	35	1.75	26	2.2	1.45	1.2	1.05	1.1
11	1.5	1.75	1.45	1.1		1.3	27	3.0	1.4	1.2	1.15	1.1
12	1.55	1.7	1.3	1.05	1.15	1.3	28	2.6	1.35	1.15	1.95	1.1
13	2.75	1.65	1.3	1.05	1.2	.....	29	2.5	1.45	1.25	1.45	1.05
14	1.9	1.6	1.25	1.0	1.2	.....	30	2.3	1.4	1.35	1.2	1.15
15	1.7	1.55	1.2	1.05	1.2	.....	31	1.6	.....	1.3	1.2	.....
16	1.6	1.4	1.15	1.05	1.2	.....						

Rating table for Israel River (above South Branch) near Jefferson Highland, N. H. 1903-1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	3.0	1.60	30	2.10	79	2.60	158
1.10	5.3	1.70	38	2.20	93	2.70	176
1.20	8.6	1.80	46	2.30	108	2.80	194
1.30	13	1.90	55	2.40	124	2.90	212
1.40	18	2.00	67	2.50	140	3.00	230
1.50	24						

NOTE.—The above table is applicable only for open-channel conditions. It is based on dis measurements made during 1903-1906 and is fairly well defined below gage heights 2.4 feet.

harge of Israel River (above South Branch) near Jefferson Highlands, N. H., for 1906.

[Drainage area, 8.7 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	230	24	63.8	7.33	8.45
.....	124	13	33.1	3.80	4.24
.....	21	6.8	12.4	1.43	1.65
.....	61	3.0	7.84	.901	1.04
.....	50	4.0	9.59	1.10	1.23
.....	42	5.3	11.2	1.29	.58

es are rated as approximate.

VER (BELOW SOUTH BRANCH) NEAR JEFFERSON HIGHLANDS, N. H.

ıtion was established September 2, 1903. It is located at ooden highway bridge about 2 miles from the railway sta- ›fferson Highlands, in the town of Jefferson. The condi- the bench marks are described in New Hampshire Forestry ›r 1903–1906 and in Water-Supply Paper No. 165, page 125, given also references to publications that contain data for 'ears. During 1906 the gage was read by William Russell.

asurements of Israel River (below South Branch) near Jefferson Highlands, N. H., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
T. W. Norcross.....	40	30	1.80	98
G. M. Brett.....	15.6	13	1.07	11.8
F. E. Pressey.....	16	13.9	1.20	14.0

a Measured by wading.

eight, in feet, of Israel River (below South Branch) near Jefferson Highlands, N. H., for 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	1.8	1.8	1.5	1.2	1.25	1.2	1.3	1.3
.....	1.7	1.75	1.45	1.15	1.2	1.15	1.25	1.4
.....	1.9	2.05	1.45	1.15	1.95	1.15	1.25	1.4
.....	1.8	1.8	1.5	1.1	1.7	1.15	1.2	1.7
.....	2.2	1.7	1.5	1.1	1.4	1.1	1.2	1.7
.....	2.0	1.7	1.45	1.1	1.3	1.1	1.2	1.8
.....	1.9	2.2	1.35	1.6	1.25	1.1	1.15	1.8
.....	1.7	1.8	1.35	1.35	1.2	1.25	1.2	1.8
.....	1.65	1.8	1.35	1.2	1.25	1.1	1.2	1.8
.....	2.0	1.7	1.4	1.15	1.45	1.7	1.2	1.8
.....	1.65	1.75	1.45	1.15	1.3	1.3	1.2	1.8
.....	1.65	1.65	1.4	1.15	1.25	1.3	1.2	1.8
.....	2.8	1.6	1.35	1.15	1.2	1.25	1.2	1.8
.....	2.05	1.55	1.3	1.1	1.2	1.25	1.2	1.8
.....	1.8	1.5	1.25	1.1	1.2	1.25	1.5	1.9

Daily gage height, in feet, of Israel River (below South Branch) near Jefferson Highlands, N. H., for 1906—Continued.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	1.8	1.45	1.2	1.1	1.2	1.2	1.4	1.7
17	1.9	1.45	1.2	1.05	1.15	1.2	1.2	1.6
18	2.05	1.5	1.35	1.05	1.15	1.2	1.2	1.6
19	2.25	1.5	1.2	1.05	1.15	1.2	1.9	1.55
20	1.8	1.45	1.2	1.05	1.15	1.45	1.45	1.55
21	1.85	1.4	1.2	1.15	1.15	1.35	1.4	1.5
22	1.6	1.35	1.45	1.15	1.15	1.3	1.3	1.5
23	1.55	1.35	1.25	1.1	1.2	1.25	1.2	1.4
24	1.6	1.7	1.25	1.3	1.15	1.25	1.2	1.5
25	1.7	1.55	1.25	1.1	1.15	1.25	[a] 1.3	1.4
26	2.2	1.5	1.2	1.1	1.15	1.45	1.3	1.4
27	2.05	1.45	1.15	1.1	1.15	1.35	1.3	1.5
28	2.6	1.4	1.15	2.0	1.15	1.3	1.3	1.5
29	2.2	1.45	1.1	1.45	1.1	1.25	1.4	1.5
30	2.05	1.4	1.35	1.2	1.2	1.25	1.3	1.4
31	1.9	.....	1.3	1.0	.....	1.2	.....	1.5

[a] Ice jam below gage, discharge corrected.

NOTE.—The river was frozen December 2 to 14 and 27 to 29. Records for November and December are of doubtful value on account of anchor ice in the river and of jams of anchor ice and masses of snow.

Rating table for Israel River (below South Branch) near Jefferson Highlands, N. H., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	10	1.60	66	2.20	211	2.80	385
1.10	15	1.70	84	2.30	240	2.90	414
1.20	21	1.80	105	2.40	269	3.00	443
1.30	29	1.90	128	2.50	298		
1.40	39	2.00	154	2.60	327		
1.50	51	2.10	182	2.70	356		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906, and it is well defined between gage heights 0.9 foot and 2.6 feet.

Monthly discharge of Israel River (below South Branch) near Jefferson Highlands, N. H., for 1906.

[Drainage area, 21.2 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
May	428	58	149	7.03	8.10
June	211	34	73.1	3.45	3.85
July	51	15	32.1	1.51	1.74
August	154	10	24.0	1.13	1.30
September	141	15	28.3	1.33	1.48
October	84	15	26.5	1.25	1.44
November	128	21	28.3	1.33	1.48

NOTE.—Values are rated as fair.

AMMONOOSUC RIVER AT BRETTON WOODS, N. H.

station was established August 28, 1903. It is located at the ighway bridge near Mount Pleasant House, at Bretton Woods. nditions and the bench marks are described in New Hampshire ry Reports for 1903–1906, and in Water-Supply Paper No. 165, 28, where are given also references to publications that con- ıta for previous years.

e measurements of Ammonoosuc River near Bretton Woods, N. H., in 1905–6.

:.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	T. W. Norcross	40	157	3.61	534
.....	Murphy and Barrows	38	83	1.80	54
a.....	T. W. Norcross	40	106	2.40	129
.....	do	39	89	1.93	62
b.....	do	30	27.6	1.58	31.6
7c.....	do	24	28.5	1.57	30.4
.					
.....	T. W. Norcross	40	117	2.50	159
.....	G. M. Brett	27.5	22	1.51	21
.....	F. E. Pressey	31	34	1.65	25

a Meter in poor condition.
b By wading, 150 above gage; meter fastened to a rod.
c From upstream side of highway bridge.

ıge height, in feet, of Ammonoosuc River at Bretton Woods, N. H., for 1906.

:.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	1.55	1.75	.....	1.80	2.84	2.58	2.58	1.68	1.62	1.68	1.85	1.90
.....	1.55	1.75	.....	1.54	2.58	2.55	2.38	1.62	1.60	1.62	1.85	1.90
.....	1.55	1.75	.....	1.52	3.05	2.80	1.95	1.52	1.92	1.60	1.82	.....
.....	1.58	1.75	.....	1.54	2.85	2.58	2.68	1.50	2.10	1.52	1.80	.....
.....	1.60	1.75	.....	1.70	3.15	2.40	2.30	1.50	1.80	1.50	1.80	.....
.....	1.60	.....	.....	1.70	2.82	2.75	2.08	1.65	1.68	1.55	1.80	1.80
.....	1.60	.....	1.60	1.54	2.72	3.10	1.95	1.72	1.62	1.80	1.80	.....
.....	1.60	.....	1.50	1.52	2.55	2.72	1.88	1.62	1.60	1.70	1.80	1.70
.....	1.55	1.70	1.50	1.52	2.68	2.52	1.85	1.55	1.60	1.75	1.78	.....
.....	1.55	1.60	1.50	1.52	2.95	2.35	1.90	1.50	2.10	2.15	1.75	1.70
.....	1.50	.....	1.50	1.47	2.60	2.28	1.88	1.50	1.75	1.98	1.72	.....
.....	1.50	.....	.....	1.47	2.52	2.22	1.82	1.50	1.62	1.88	1.70	1.70
.....	1.50	.....	.....	1.60	3.80	2.10	1.78	1.50	1.60	1.85	1.70	.....
.....	1.50	.....	.....	1.77	2.98	2.02	1.72	1.50	1.60	1.85	1.70	.....
.....	1.52	1.50	1.50	3.37	2.85	1.98	1.75	1.48	1.60	1.80	1.75	1.75
.....	1.62	.....	.....	3.20	2.78	1.92	1.75	1.45	1.60	1.78	1.80	.....
.....	1.58	1.50	.....	2.87	2.70	2.05	1.72	1.42	1.60	1.75	1.78	1.68
.....	1.55	.....	.....	2.77	2.60	2.18	1.72	1.40	1.58	1.75	1.75	1.65
.....	1.55	.....	.....	2.80	2.58	2.02	1.62	1.40	1.52	1.75	2.52	1.65
.....	1.55	1.50	.....	2.92	2.52	1.95	1.60	1.42	1.50	2.85	2.30	1.65
.....	1.55	1.58	1.35	3.27	2.48	1.85	1.88	1.50	1.50	2.15	2.00	1.65
.....	2.45	1.80	1.35	2.94	2.42	1.85	1.88	1.48	1.52	2.02	1.98	1.65
.....	3.68	1.70	1.38	2.62	2.30	1.88	1.80	1.68	1.60	1.98	1.95	1.62
.....	3.75	1.58	1.40	2.42	2.35	2.25	1.75	1.82	1.50	1.92	1.90	1.60
.....	2.50	1.58	1.40	2.10	3.08	2.05	1.62	1.62	1.45	2.53	1.88	1.60

Daily gage height, in feet, of Ammonoosuc River at Bretton Woods, N. H., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
26	2.25	1.70	1.40	2.07	2.78	1.98	1.58	1.58	1.45	2.28	1.85	1.5[illegible]
27	2.15	1.62	1.58	2.07	4.65	1.88	1.52	2.20	1.60	2.10	2.02	1.5[illegible]
28	2.05	.....	2.08	2.02	4.20	1.75	1.50	2.70	1.62	2.08	2.12	1.5[illegible]
29	1.85	.....	1.70	2.17	3.55	2.48	1.50	1.95	1.52	2.02	1.98	1.5[illegible]
30	1.80	.....	1.70	2.82	2.80	2.58	1.95	1.75	1.90	1.98	1.92	1.5[illegible]
31	1.80	.....	1.68	.....	2.70	.....	1.95	1.70	.....	1.95	.....	1.5[illegible]

NOTE.—The following ice conditions prevailed during 1906: River open January 1 to February 5; frozen most of the time from February 5 to March 21, except in narrow strips just above and below gage. Ice went out about March 21. Anchor ice reported on April 1 and 5 and on December 2. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
February 9	1.7	2.1	0.4	December 8, 10, 12	1.7	.....	0.6
February 10	1.6	2.1	.4	December 15	1.75	.....	.6
February 15	1.5	1.75	.35	December 17	1.68	.....	.6
February 17	1.5	1.95	.4	December 18–20	1.65	.....	.4
March 15	1.5	1.75	.35	December 21	1.65	.....	.3[illegible]
December 6	1.8	.....	.45				

Rating table for Ammonoosuc River at Bretton Woods, N. H.

JANUARY 1 TO DECEMBER 31, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	20	2.00	75	2.60	185	3.20	388
1.50	26	2.10	88	2.70	213	3.30	428
1.60	33	2.20	103	2.80	243	3.40	469
1.70	42	2.30	120	2.90	275	3.50	510
1.80	52	2.40	139	3.00	310	3.60	552
1.90	63	2.50	160	3.10	348		

JANUARY 1 TO DECEMBER 31, 1906.[b]

1.40	15	2.30	118	3.20	388	4.00	726
1.50	20	2.40	138	3.30	428	4.10	770
1.60	27	2.50	160	3.40	469	4.20	815
1.70	36	2.60	185	3.50	510	4.30	860
1.80	46	2.70	213	3.60	552	4.40	905
1.90	57	2.80	243	3.70	595	4.50	950
2.00	70	2.90	275	3.80	638	4.60	995
2.10	84	3.00	310	3.90	682	4.70	1,040
2.20	100	3.10	348				

[a] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1905 and is fairly well defined.

[b] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1906 and is not well defined.

Discharge of Ammonoosuc River at Bretton Woods, N. H., for 1905–6.

[Drainage area, 34 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
.....	544	26	256	7.53	3.08
.....	282	32	147	4.32	4.82
.....	531	75	192	5.65	6.51
.....	228	35	86.7	2.55	2.84
.....	329	20	47.6	1.40	1.61
.....	228	33	69.1	2.03	2.34
.....	213	47	86.7	2.55	2.84
.....	111	29	41.0	1.21	1.40
.....	88	17	29.1	.856	.955
.....	199	26	58.0	1.71	.954
1906.					
.....	81	13	27.1	.797	.326
.....	457	18	132	3.88	4.33
.....	1,020	118	290	8.53	9.83
.....	348	41	122	3.59	4.00
.....	207	20	59.6	1.75	2.02
.....	213	15	34.6	1.02	1.18
.....	84	17	32.5	.956	1.07
.....	259	20	64.8	1.91	2.20
.....	165	36	57.3	1.69	1.89

for 1905 are rated as follows: March to September and December, fair; October and
oximate. Values for 1906 are rated as follows: March and September to November,
ril to August, good.

ZEALAND RIVER NEAR TWIN MOUNTAIN, N. H.

ion was established August 29, 1903. It is located about
ve the mouth of the river, which empties into the Ammo-
a point midway between Fabyans and Twin Mountain,
iles from either place. The conditions at the station and
narks are described in New Hampshire Forestry Reports
and in Water-Supply Paper No. 165, page 30, where
lso references to publications that contain data for previ-
Length of chain changed to 12.99 feet, May 2, 1906, and
t, October 3, 1906, on account of settling of one of the trees
e gage is fastened.

measurements of Zealand River near Twin Mountain, N. H., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
T. W. Norcross	46	37	2.85	96
G. M. Brett	19.5	12	2.01	6.8
...do	12.2	6.2	2.01	7.6
F. E Pressey	25	13.5	2.02	6.4

[a] Measured by wading.

Daily gage height, in feet, of Zealand River near Twin Mountain, N. H., for 1906.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.45	2.6	2.6	2.35	2.3	2.25	2.5	2.75
2	.....	3.0	2.6	2.45	2.3	2.15	2.25	2.45	.....
3	.....	3.3	2.8	2.25	2.25	2.2	2.8	2.4	.....
4	.....	3.2	2.6	2.65	2.25	2.1	2.6	2.4	.....
5	.....	3.3	2.55	2.55	2.25	2.05	2.3	2.4	.....
6	.....	2.9	3.2	2.45	2.25	2.0	2.3	2.35	.....
7	.....	3.0	3.0	2.35	2.25	2.0	2.5	2.35	.....
8	2.55	2.7	2.9	2.3	2.35	2.0	2.4	2.25	.....
9	2.55	2.9	2.8	2.35	2.3	2.3	2.6	2.25	.....
10	2.55	3.0	2.7	2.4	2.2	2.0	2.8	2.25	.....
11	2.45	2.9	2.7	2.35	2.25	2.0	3.2	2.3	.....
12	2.35	2.8	2.6	2.3	2.25	1.95	3.1	2.35	.....
13	2.25	3.7	2.55	2.25	2.2	1.9	2.9	2.35	.....
14	2.55	3.05	2.5	2.15	2.15	1.9	2.6	2.4	.....
15	4.05	2.9	2.45	2.25	2.2	1.85	2.55	2.5	.....
16	3.55	2.95	2.3	2.3	2.2	2.05	2.5	2.4	.....
17	3.45	2.95	2.5	2.3	2.15	2.05	2.5	2.4	.....
18	3.55	2.9	2.45	2.35	2.1	2.15	2.5	2.5	.....
19	3.35	2.7	2.4	2.3	2.05	2.1	2.45	2.6	.....
20	3.85	2.7	2.3	2.3	2.05	2.05	2.8	2.9	.....
21	4.0	2.5	2.3	2.8	2.15	2.0	2.4	2.8	.....
22	3.15	2.45	2.35	2.5	2.15	2.0	2.8	2.8	.....
23	2.85	2.45	2.4	2.55	2.25	2.25	2.7	2.6	.....
24	2.75	2.5	2.7	2.4	2.2	2.35	2.6	2.5	.....
25	2.75	3.2	2.6	2.35	2.15	2.25	2.9	2.5	.....
26	2.75	2.7	2.45	2.25	2.15	2.25	3.0	2.7	.....
27	2.75	4.0	2.[illegible]5	2.2	3.05	2.15	2.85	2.8	.....
28	2.65	3.8	2.35	2.15	2.65	2.15	2.65	2.9	.....
29	2.70	3.25	2.75	2.2	2.45	2.15	2.6	2.8	.....
30	3.75	2.85	2.7	2.6	2.35	2.35	2.65	2.8	.....
31	.....	2.75	.....	2.5	2.35	.....	2.5	.....	.....

Rating table for Zealand River near Twin Mountain, N. H., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.85	3	2.30	24	2.90	127	3.50	330
1.90	4	2.40	34	3.00	156	3.60	368
1.95	5	2.50	45	3.10	188	3.70	406
2.00	6	2.60	60	3.20	222	3.80	445
2.10	11	2.70	78	3.30	257	3.90	485
2.20	17	2.80	100	3.40	293	4.00	526

NOTE.—The above table is applicable only for open-channel conditions. It is based upon four discharge measurements made during 1906, and is merged with the 1905 table at gage height 2.6 feet. It is fairly well defined.

Monthly discharge of Zealand River near Twin Mountain, N. H., for 1906.

[Drainage area, 14 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (8-30)	546	20	190	13.57	11.61
May	526	39	169	12.07	13.91
June	222	24	64.8	4.63	5.17
July	100	14	34.2	2.44	2.81
August	172	8	25.8	1.84	2.12
September	29	3	12.2	.871	.97
October	222	24	74.9	5.35	6.17
November	127	20	54.0	3.86	4.31

NOTE.—Values are rated as approximate, owing to settling of gage and erroneous gage heights.

DEERFIELD RIVER AT DEERFIELD, MASS.

This station was established March 29, 1904, at the suspension hway bridge, about one-fourth mile from the West Deerfield raily station and about 6 or 7 miles above the mouth of the river. It s discontinued December 31, 1905. The conditions at this station l the bench marks are described in Water-Supply Paper No. 165, ge 134, where are given also references to publications that contain a for previous years.

Discharge measurements of Deerfield River at Deerfield, Mass., in 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
h 30	N. C. Grover		2,180	3.61	2,390
l 11	S. K. Clapp		2,500	4.68	5,810
l 25	do		2,480	4.58	5,010
18	do		2,270	3.75	3,420
1	do		1,920	2.81	590
20 [a]	do		449	2.70	850
28 [a]	do		259	2.60	513
st 17 [a]	do		168	2.45	275
ember 17	T. W. Norcross		2,020	3.21	1,260
ber 27	do		2,010	2.90	981
ember 30 [ab]	do		288	2.60	531
1905.					
l 4	T. W. Norcross	319	2,270	3.97	3,710
st 16	do	315	2,040	3.29	1,680
st 16	do	318	2,120	3.56	2,290
st 16	do	318	2,140	3.69	2,520
st 17	do	318	2,130	3.68	2,380
st 17	do	318	2,110	3.51	2,000
st 17	do	318	2,100	3.42	1,840
st 31	do	314	2,020	3.12	1,310
1906.					
ember 21 [a]	F. E. Pressey	180	110	1.58	85

[a] By wading at different sections.
[b] River frozen at gage 0.1 foot thick. Gage height to bottom of ice.

Rating table for Deerfield River at Deerfield, Mass., for 1904–5.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.20	180	3.20	1,450	4.20	3,900	5.40	8,250
2.30	220	3.30	1,650	4.30	4,200	5.60	9,120
2.40	280	3.40	1,860	4.40	4,510	5.80	10,030
2.50	370	3.50	2,080	4.50	4,830	6.00	10,980
2.60	490	3.60	2,310	4.60	5,170	6.20	11,970
2.70	620	3.70	2,550	4.70	5,520	6.40	12,980
2.80	760	3.80	2,800	4.80	5,880	6.60	14,030
2.90	910	3.90	3,060	4.90	6,250	6.80	15,100
3.00	1,080	4.00	3,330	5.00	6,630	7.00	16,200
3.10	1,260	4.10	3,610	5.20	7,420	7.20	17,300

TE.—The above table is applicable only for open-channel conditions. It is based on twenty dis-ge measurements made during 1904–1906 and is fairly well defined between gage heights 2.5 feet 5 feet. The rating below gage height 2.5 feet is very uncertain.

Monthly discharge of Deerfield River at Deerfield, Mass., for 1904–5.

[Drainage area, 550 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
April	10,700	1,550	4,050	7.36	[illegible]
May	5,340	620	2,270	4.13	[illegible]
June	11,200	250	1,200	2.18	[illegible]
July	910	280	411	.747	[illegible]
August	3,200	220	476	.865	[illegible]
September	9,120	180	915	1.66	[illegible]
October	5,880	325	983	1.79	[illegible]
November	760	220	336	.611	[illegible]
1905.					
January 7–13	17,300	1,760	5,000	9.09	[illegible]
March 27–31	14,000	8,460	10,900	19.80	[illegible]
April	9,340	1,260	3,380	6.15	[illegible]
May	1,450	325	716	1.30	[illegible]
June	4,200	220	682	1.24	[illegible]
July	2,080	180	421	.765	[illegible]
August	2,310	180	588	1.07	[illegible]
September	8,680	490	2,110	3.84	[illegible]
October	1,800	325	630	1.15	[illegible]
November	5,520	280	696	1.27	[illegible]
December 1–15	12,000	760	2,240	4.07	[illegible]

NOTE.—Values for 1904 are rated as follows: April to June, September and October, good; remainder of year, approximate. Values for 1905 are rated as follows: January, April, September, and December, good; March, May, June, August, October, and November, fair; July, approximate.

DEERFIELD RIVER AT HOOSAC TUNNEL, MASS.

A measurement was made October 29, 1906, from the downstream side of the highway bridge at this point. The bench mark is the top of guard rail 25 feet from the downstream side of the left abutment, the distance to water surface being 23.63 feet.

Width, 125 feet; area, 130 square feet; discharge, 66 second-feet.

WARE RIVER NEAR WARE, MASS.

This station was established September 15, 1904, at the steel highway bridge about 2 miles above the village of Ware, Mass. The conditions and the bench marks are described in Water-Supply Paper No. 165, page 136, where are given also references to publications that contain data for previous years.

Discharge measurements of Ware River near Ware, Mass., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 21 [a]	T. W. Norcross	83	159	3.40	[illegible]
April 7	do	83	230	4.17	[illegible]
October 18	F. E. Pressey	80	113	3.05	[illegible]

[a] Probably an ice jam below bridge.

Daily gage height, in feet, of Ware River near Ware, Mass., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	3.05	2.9	3.6	4.6	3.5	4.35	3.5	3.05	2.2	3.2	3.15	3.4
.....	2.95	2.9	3.4	4.2	3.25	4.0	3.8	3.0	2.3	2.8	3.1	2.35
.....	2.95	2.85	3.1	3.8	3.3	3.9	3.9	3.0	3.0	2.8	3.0	3.3
.....	3.15	2.8	6.05	3.7	3.3	3.5	4.1	3.05	3.4	2.8	2.7	[e] 4.1
.....	3.5	2.75	5.65	3.7	3.35	3.3	4.2	3.0	2.45	2.7	2.8	[e] 4.65
.....	3.2	[a] 4.1	4.1	4.15	2.9	3.55	3.4	3.05	2.8	2.3	2.9	2.75
.....	3.1	[a] 4.65	3.55	4.3	3.45	3.15	3.4	3.0	2.85	2.35	3.1	3.3
.....	3.25	[a] 3.75	3.75	4.0	3.45	3.15	3.2	.....	.....	2.15	2.8	[e] 3.7
.....	3.15	[b] 5.0	3.7	3.8	3.5	3.1	2.9	2.8	.....	2.9	2.8	[e] 4.65
.....	[a] 3.5	[b] 5.0	3.4	4.15	3.3	3.0	2.9	.....	.....	3.2	2.6	[e] 5.2
.....	[a] 3.9	(c)	3.2	4.9	3.2	3.3	2.7	2.8	.....	3.2	2.4	[e] 5.0
.....	[a] 3.8	(c)	3.35	4.9	3.1	3.2	2.5	2.65	2.75	3.15	3.05	[e] 4.9
.....	3.1	(c)	3.05	4.75	3.1	3.2	2.95	2.6	2.35	2.6	3.4	[e] 4.8
.....	3.1	[d] 3.5	3.1	4.4	3.1	3.1	2.8	2.6	3.0	2.25	2.9	.....
.....	2.95	3.7	3.05	4.3	3.0	3.1	2.65	2.7	2.7	2.5	3.0	.....
.....	3.1	3.8	3.75	5.25	3.0	3.45	2.75	2.7	2.15	2.7	3.2	.....
.....	3.85	[a] 3.55	3.65	4.8	2.9	3.9	2.75	2.7	2.2	2.8	3.1	3.3
.....	3.55	[d] 2.9	2.75	4.25	3.1	4.1	2.6	2.35	2.6	3.0	2.5	2.7
.....	3.0	3.05	3.45	4.0	3.0	4.3	2.7	1.7	2.7	3.3	3.8	3.85
.....	3.0	3.95	3.0	3.85	2.8	3.95	2.5	2.7	2.7	2.9	3.75	3.9
.....	2.9	[e] 2.8	3.1	3.75	2.6	3.75	3.05	2.9	3.0	3.85	3.8	3.1
.....	3.4	4.4	2.95	3.5	2.6	3.55	2.6	2.9	2.6	2.6	3.7	3.05
.....	3.6	4.4	2.8	3.45	2.7	3.2	2.7	3.05	2.4	2.75	3.75	3.3
.....	4.1	3.7	3.1	3.5	2.6	3.3	2.6	3.2	3.15	3.2	3.0	[a] 4.4
.....	3.7	3.4	2.7	3.4	2.6	3.25	2.55	2.75	2.45	3.4	2.9	[a] 5.4
.....	3.5	3.9	2.65	3.2	2.9	3.1	2.25	2.3	2.8	4.0	3.25	[a] 5.2
.....	3.1	3.8	2.9	3.2	2.8	3.05	2.2	2.6	2.65	3.7	3.0	4.25
.....	3.3	3.5	5.1	3.05	5.6	3.05	2.25	4.4	2.5	2.8	3.1	[d] 3.65
.....	3.2	.....	5.05	2.8	6.9	2.85	2.85	4.05	1.85	3.25	2.9	2.8
.....	3.2	.....	4.7	3.3	6.3	2.7	3.8	3.3	2.25	3.3	3.15	[f] 2.5
.....	3.05	.....	4.6	.....	4.45	.....	3.4	3.25	.....	3.15	.....	2.35

[a] Backwater due to ice jam.
[b] Water flowing over ice. Anchor ice jam below gage.
[c] River full of anchor ice.
[d] Ice going out.
[e] Ice jam about 30 feet below gage.
[f] River clear of ice.

NOTE.—River does not usually freeze at gaging section, but frequent difficulty is experienced from backwater due to a jam of anchor ice about 500 feet below.

Rating table for Ware River near Ware, Mass., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.70	20	2.80	235	3.90	624	5.00	1,212
1.80	30	2.90	264	4.00	670	5.20	1,332
1.90	42	3.00	294	4.10	718	5.40	460
2.00	55	3.10	325	4.20	768	5.60	1,590
2.10	71	3.20	357	4.30	820	5.80	1,725
2.20	89	3.30	390	4.40	873	6.00	1,865
2.30	109	3.40	424	4.50	927	6.20	2,005
2.40	131	3.50	460	4.60	982	6.40	2,155
2.50	155	3.60	498	4.70	1,038	6.60	2,305
2.60	180	3.70	538	4.80	1,095	6.80	2,460
2.70	207	3.80	580	4.90	1,153	7.00	2,620

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904–1906 and is well defined between gage heights 1.9 feet and 7 feet.

Monthly discharge of Ware River near Ware, Mass., for 1906.

[Drainage area, 162 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	1,360	235	685	4.23	4.72
May	2,540	180	503	3.10	3.57
June	846	207	445	2.75	3.07
July	768	89	307	1.90	2.19
August	873	20	278	1.72	1.98
September	424	36	197	1.22	1.36
October	670	80	292	1.80	2.08
November	580	131	329	2.03	2.26

NOTE.—Values are rated as good.

WARE RIVER AT BARRE PLAINS, MASS.

A measurement was made October 18, 1906, from the downstream side of the wooden highway bridge at Barre Plains. The bench mark is top of top chord of bridge, 20 feet from downstream side of left abutment. The distance to water surface was 15.33 feet.

Width, 53 feet; area, 132 square feet; discharge, 104 second-feet.

QUABOAG RIVER AT WEST WARREN, MASS.

A station for securing a record of flow of Quaboag River has been maintained by the United States Geological Survey at West Warren, at the dam of J. T. F. MacDonnell, of Holyoke, since October 22, 1904. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 139, where are given also references to publications that contain data for previous years.

A measurement was made October 19, 1906, by wading, 150 feet below the tail race, with the following results:

Width, 125 feet; area, 120 square feet; gage height, 50.60 feet; discharge, 173 second-feet.

Daily gage height, in feet, of Quaboag River at West Warren, Mass., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	50.45	50.7	50.85	51.4	51.0	51.35	50.7	50.6	50.45	50.3	50.8	50.55
2	50.45	50.65	50.8	51.4	51.0	51.3	50.75	50.6	50.5	50.3	50.75	50.55
3	50.4	50.6	50.85	51.4	51.0	51.15	51.05	50.55	50.5	50.25	50.7	50.55
4	50.45	50.55	51.05	51.35	51.0	51.15	51.1	50.6	50.45	50.3	50.7	50.5
5	50.5	50.55	51.60	51.35	50.9	51.15	51.0	50.6	50.45	50.3	50.65	50.5
6	50.45	50.5	51.55	51.3	50.9	51.1	51.0	50.6	50.5	50.3	50.65	50.5
7	50.45	50.5	51.5	51.3	50.9	51.1	50.95	50.7	50.45	50.4	50.6	50.5
8	50.45	50.55	51.45	51.25	50.9	51.0	50.9	50.65	50.45	50.4	50.55	50.45
9	50.45	50.5	51.4	51.25	50.9	51.0	50.9	50.65	50.45	50.35	50.5	50.5
10	50.45	50.5	51.35	51.35	50.85	50.9	50.85	50.6	50.4	50.55	50.5	50.5
11	50.5	50.5	51.2	51.4	50.85	50.9	50.8	50.6	50.4	50.6	50.45	50.55
12	50.55	50.5	51.2	51.45	50.85	50.85	50.8	50.6	50.4	50.6	50.75	50.5
13	50.55	50.5	51.15	51.45	50.8	50.85	50.75	50.6	50.35	50.55	50.7	50.45
14	50.6	50.45	51.1	51.45	50.8	50.8	50.7	50.6	50.4	50.55	50.7	50.5
15	50.6	50.45	51.0	51.5	50.8	50.8	50.6	50.55	50.35	50.55	50.65	50.5
16	50.6	50.5	51.05	51.5	50.75	50.8	50.6	50.5	50.35	50.5	50.7	50.55
17	50.8	50.5	51.2	51.5	50.7	50.9	50.65	50.6	50.35	50.5	50.7	50.55
18	50.85	50.55	50.8	51.45	50.7	50.9	50.65	50.6	50.3	50.45	50.75	50.55
19	50.9	50.55	50.8	51.4	50.65	50.9	50.65	50.6	50.3	50.45	50.75	50.5
20	50.9	50.6	50.8	51.4	50.6	50.85	50.7	50.6	50.35	50.45	50.7	50.5

ly gage height, in feet, of Quaboag River at West Warren, Mass., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	50.95	50.65	50.75	51.35	50.6	50.85	50.75	50.55	50.3	51.1	50.6	50.5
.....	51.0	51.25	50.75	51.3	50.6	50.8	50.8	50.6	50.3	51.1	50.7	50.55
.....	51.0	51.2	50.75	51.3	50.55	50.75	50.8	50.55	50.45	51.05	50.7	50.55
.....	51.1	51.0	50.7	51.3	50.55	50.7	50.85	50.55	50.45	51.0	50.65	50.55
.....	51.0	50.95	50.7	51.25	50.5	50.65	50.8	50.5	50.4	50.95	50.65	50.5
.....	50.95	50.95	50.75	51.2	50.5	50.65	50.75	50.5	50.4	50.9	50.65	50.5
.....	50.9	50.9	50.75	51.2	50.5	50.6	50.7	50.5	50.35	50.9	50.6	50.5
.....	50.85	50.9	51.4	51.1	51.0	50.6	50.65	50.55	50.3	50.85	50.6	50.5
.....	50.85	.....	51.45	51.1	51.5	50.6	50.6	50.55	50.3	50.85	50.6	50.5
.....	50.8	.....	51.45	51.1	51.5	50.6	50.6	50.5	50.25	50.8	50.6	50.5
.....	50.75	.....	51.4	51.0	51.4	.....	50.65	50.5	.....	50.8	.....	51.2

OTE.—The gage was read once a day, about 6.15 a. m. (before the mill upstream starts up) on week 'a and about 4 p. m. on Sundays.
he discharge is not affected by ice conditions.

Monthly discharge of Quaboag River at West Warren, Mass., for 1906.

[Drainage area, 144 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary	416	89	213	1.48	1.71
bruary	507	106	198	1.38	1.44
rch	783	205	432	3.00	3.46
ril	675	416	562	3.90	4.35
y	675	123	285	1.98	2.28
ne	571	161	303	2.10	2.34
ly	416	161	245	1.70	1.96
gust	205	123	152	1.06	1.22
ptember	123	41	85.1	.591	.66
tober	416	41	181	1.26	1.45
vember	254	106	186	1.29	1.44
cember	476	106	139	.965	1.11
The year	783	41	248	1.72	23.41

QUABOAG RIVER AT PALMER, MASS.

A measurement was made October 19, 1906, from the downstream de of the highway bridge near Palmer railroad station. The bench ark is top of floor beam, 72 feet from the right abutment, downtream side of bridge. Distance to water surface, 14.25 feet.

Width, 77 feet; area, 170 square feet; discharge, 110 second-feet.

WESTFIELD LITTLE RIVER NEAR BLANDFORD, MASS.

This station was established July 13, 1905, at Cobble Mountain, ear Blandford, Mass., a short distance below Borden Brook. It is aintained in cooperation with the water board of the city of Springld, through their engineer, E. E. Lochridge. The conditions and e bench marks are described in Water-Supply Paper No. 165, page 2, where are given also references to publications that contain ta for previous years.

On August 10, 1906, a sharp-crested weir, with length of crest .98 feet, capable of carrying a depth of flow of 1.5 feet, was installed

a short distance downstream from the current-meter station. Estimates of flow over the weir are given, based upon the coefficients given on page 36, Water-Supply Paper 150. The weir gage was read at approximately the same times as the current-meter gage.

Discharge measurements of Westfield Little River near Blandford, Mass., in 1905-6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec-ft.*
1905.					
July 14 [a]	Barrows and Norcross	34	44	2.32	[illegible]
August 10 [a]	Norcross and Lochridge	32	51	2.30	[illegible]
September 8 [a]	do	46	73	2.98	[illegible]
September 27 [a]	T. W. Norcross	39	54	2.40	[illegible]
September 28 [a]	do	39	53	2.39	[illegible]
October 13	do	44	77	2.64	[illegible]
October 14	do	42	71	2.76	[illegible]
November 9	Norcross and Lochridge	39	59	2.57	[illegible]
1906.					
March 23 [b]	T. W. Norcross	40	46	2.61	[illegible]
April 5	do	65	144	4.21	[illegible]
April 6	do	69	172	4.64	[illegible]
April 6	do	69	166	4.53	[illegible]
April 6	do	68	164	4.50	[illegible]
April 6	do	69	159	4.44	[illegible]
April 23	do	50	93	3.31	[illegible]
April 24	do	50	88	3.21	[illegible]
June 22	F. E. Pressey	35	53	2.48	[illegible]
August 9	do	38	64	2.58	[illegible]
August 10	do	32	47	2.34	[illegible]
August 10	do	32	47	2.32	[illegible]
August 10	do	32	46	2.34	[illegible]
August 10	G. M. Brett	33	46	2.34	[illegible]
August 10	F. E. Pressey	32	46	2.34	[illegible]
August 10	G. M. Brett	33	46	2.33	[illegible]
August 10	Barrows and Pressey	32	44	2.33	[illegible]
September 18 [c]	F. E. Pressey	7.0	4.2	1.68	[illegible]
September 18 [c]	do	6.0	2.7	1.68	[illegible]
September 19 [c]	do	5.5	3.5	1.68	[illegible]
September 19 [c]	do	5.5	3.5	1.68	[illegible]
September 19 [c]	do	5.5	3.5	1.68	[illegible]
September 19 [c]	do	5.5	3.5	1.68	[illegible]
September 19 [c]	do	5.5	3.6	1.68	[illegible]
September 19 [c]	do	5.5	3.6	1.68	[illegible]
September 19 [c]	do	5.5	3.6	1.68	[illegible]
September 19 [c]	do	5.5	3.6	1.68	[illegible]
September 24 [d]	do	10	7.6	2.09	[illegible]
September 25 [d]	do	10	7.2	2.04	[illegible]
September 25 [d]	do	8	6.4	2.02	[illegible]
September 25 [d]	do	8	6.4	2.02	[illegible]
October 21	do	49	86	3.28	[illegible]
October 22	do	43	76	3.00	[illegible]
October 22	do	43	74	3.00	[illegible]
October 22	do	43	72	2.99	[illegible]
October 22	do	48	76	2.99	[illegible]
October 22	do	43	72	2.98	[illegible]
October 22	do	43	70	2.93	[illegible]
October 22	do	43	71	2.92	[illegible]
October 23	do	42	66	2.76	[illegible]
October 23	do	42	67	2.75	[illegible]
October 23	do	41	66	2.72	[illegible]
October 23	do	41	66	2.71	[illegible]
October 23	do	40	66	2.72	[illegible]
October 24	do	38	60	2.60	[illegible]
October 24	do	38	57	2.59	[illegible]
October 24	do	38	58	2.58	[illegible]
October 24	do	38	57	2.56	[illegible]
October 24	do	38	56	2.56	[illegible]
October 24	do	38	57	2.58	[illegible]
October 25	do	48	89	3.28	[illegible]
October 25	do	48	86	3.28	[illegible]
October 25	do	48	88	3.26	[illegible]
November 23	Lee and James	45	81	3.02	[illegible]
November 24	do	43	72	2.84	[illegible]

[a] By wading; meter on a rod.
[b] River frozen over.
[c] Measured 300 feet below gage.
[d] Measured 300 feet below weir.

ight, in feet, of Westfield Little River near Blandford, Mass., for 1905–6.

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
					3.50	2.47	2.32	2.38	3.28
					3.05	2.50	2.32	2.38	[a] 3.30
					2.84	4.08	2.58	2.35	4.18
					2.68	5.25	2.46	2.75	3.88
					2.46	4.35	2.39	2.58	[a] 3.40
					2.32	3.60	2.34	2.68	3.30
					2.46	3.25	2.30	2.78	3.15
					2.41	3.00	2.28	2.68	3.00
					2.40	2.84	2.28	2.59	2.95
					2.30	2.68	2.25	2.55	3.00
					2.38	2.60	2.24	2.48	[a] 3.10
					2.36	3.66	3.45	2.46	[a] 3.10
				2.58	2.24	3.65	2.98	2.44	[a] 3.10
				2.37	2.14	3.30	2.76	2.44	[a] 3.00
				2.25	2.44	2.95	2.60	[a] 2.52	[a] 2.90
				2.06	2.95	2.82	2.51	[a] 2.49	[a] 2.90
				1.98	2.80	2.80	2.50	2.47	[a] 2.90
				1.92	2.53	3.00	2.48	2.45	[a] 3.00
				2.25	2.34	3.01	2.46	2.40	[a] 3.00
				2.26	2.26	2.90	3.20	[a] 2.50	[a] 3.00
				2.13	2.19	2.98	2.95	[a] 2.60	[b] 4.00
				2.00	2.16	2.84	2.73	[a] 2.60	3.40
				1.94	2.10	2.68	2.59	[a] 2.60	3.35
				1.90	2.08	2.58	2.60	2.50	3.10
				1.93	2.80	2.52	2.60	2.50	3.08
				1.88	2.58	2.44	2.53	2.48	3.00
				1.86	2.42	2.44	2.46	2.48	2.90
				1.84	2.37	2.42	2.43	3.32	2.90
				1.90	2.49	2.36	2.40	3.52	3.85
				7.75	2.68	2.36	2.40	3.38	3.45
				4.30	2.57	.....	2.37	.....	3.08
	3.84	2.89	2.95	3.00	2.42	1.85	2.26	2.35	2.63
	3.45	2.84	2.77	2.66	2.32	1.80	2.18	2.31	2.42
	3.27	2.99	2.67	2.52	2.20	1.95	2.09	2.29	2.40
	3.27	2.91	2.57	3.01	2.30	1.98	2.04	2.21	2.46
	3.84	2.85	2.59	2.64	2.28	1.92	1.96	2.20	2.48
	4.48	2.83	2.97	2.45	2.20	1.85	1.92	2.18	2.73
	3.65	2.91	2.87	2.36	2.16	1.80	1.99	2.16	2.79
	3.38	2.84	2.75	2.28	2.84	1.78	1.95	2.12	2.90
	3.43	3.03	2.64	2.22	2.60	1.76	2.02	2.12	3.00
	4.41	3.16	2.74	2.24	2.36	1.75	2.82	2.08	2.78
	5.00	3.00	2.75	2.24	2.34	1.73	2.58	2.28	2.58
	4.43	2.89	2.53	2.19	2.24	1.79	2.46	2.50	2.52
	3.91	2.77	2.41	2.11	2.18	1.82	2.28	2.52	2.50
	3.73	2.66	2.30	2.06	2.08	1.78	2.12	2.47	2.54
	5.91	2.44	2.21	2.02	2.05	1.74	2.06	2.39	2.62
	4.89	2.28	2.49	1.98	2.02	1.70	2.04	2.37	3.30
	3.79	2.23	2.94	2.22	1.95	1.70	2.00	2.34	3.34
	3.57	2.17	3.08	2.38	1.96	1.68	2.08	2.70	2.88
	3.39	2.13	3.01	2.22	1.90	1.68	2.07	3.92	2.72
	3.33	2.15	2.81	2.15	1.86	1.79	3.72	3.54	2.82
	3.22	2.13	2.67	2.15	2.46	2.34	3.34	3.24	[c] 3.35
	3.13	2.10	2.55	2.10	2.20	2.42	2.96	3.24	2.88
	3.25	2.07	2.43	2.14	2.06	2.55	2.73	3.01	2.52
	3.25	2.10	2.55	2.18	2.15	2.14	2.60	2.86	2.65
	3.14	2.26	2.44	2.12	2.02	2.04	2.93	2.67	2.56
	3.06	2.21	2.36	2.00	1.98	1.98	2.92	2.64	2.50
	2.97	2.55	2.27	2.00	1.95	2.04	2.71	2.64	2.46
	2.89	3.47	2.20	2.30	2.26	1.99	2.62	2.64	2.42
	2.82	4.09	2.13	2.48	2.09	2.02	2.54	2.56	2.46
	2.97	3.48	2.12	2.95	1.99	2.38	2.44	2.60	2.51
	.....	3.17	.....	2.56	1.94	.....	2.42	.....	3.55

river. [b] River clear of ice. [c] River filled with anchor ice.

ights during freshet of July 30, 1905, estimated. Crest of flood was at gage height 8.0
Relation of gage heights to discharge changed by this flood.

Daily gage height, in feet, on weir of Westfield Little River near Blandford, Mass., for 1

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	D
1	.....	0.14	0.33	[a] 0.58	0.60	17	0.18	0.09	0.22	0.41	
2	.....	.13	.30	[a] .56	.44	18	.18	.08	.24	.69	
3	.....	.18	.26	[a] .54	.42	19	.16	.08	.24	[d] 1.90	
4	.....	.18	.24	[a] .50	.46	20	.14	.12	[d] 1.58	1.56	
5	.....	.16	.20	[a] .48	.47	21	.41	.40	1.33	1.19	
6	.....	.14	.18	[a] .48	.70	22	.31	.46	.90	1.15	
7	.....	.13	.22	[a] .47	[c] .76	23	.23	.50	.72	.92	
8	.....	.12	.20	.....	.90	24	.26	.28	.50	.76	
9	.....	.11	.22	[b] .51	.98	25	.22	.23	.92	.64	
10	0.36	.10	.69	[b] .47	.88	26	.18	.20	.85	.60	
11	.34	.09	.48	[b] .67	.94	27	.17	.26	.66	.59	
12	.32	.12	.40	[b] .92	1.06	28	.33	.20	.56	.60	
13	.25	.14	.34	[b] .96	1.00	29	.24	.22	.50	.54	
14	.24	.11	.31	[b] .84	.84	30	.20	.40	.46	.56	
15	.22	.10	.24	[b] .78	.80	31	.16	.....	.44	.....	
16	.20	.09	.24	.44	1.12						

[a] Length of weir shortened to 14.8 feet.
[b] Length of weir changed to 12.5 feet.
[c] Anchor ice in river.
[d] Gage reading probably in error as flow over weir is much smaller than that for the same day by current meter method.

Rating table for Westfield Little River near Blandford, Mass., for 1905-6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.65	2.4	2.45	29.9	3.25	141	4.40	535
1.70	3.1	2.50	33.8	3.30	155	4.50	570
1.75	3.9	2.55	38.1	3.35	170	4.60	605
1.80	4.8	2.60	42.8	3.40	186	4.70	640
1.85	5.8	2.65	47.8	3.45	203	4.80	675
1.90	6.9	2.70	53.1	3.50	220	4.90	710
1.95	8.0	2.75	58.7	3.55	238	5.00	745
2.00	9.2	2.80	64.7	3.60	255	5.10	780
2.05	10.6	2.85	71.1	3.65	272	5.20	815
2.10	12.2	2.90	77.9	3.70	290	5.30	850
2.15	14.0	2.95	85.0	3.80	325	5.40	885
2.20	16.0	3.00	92.4	3.90	360	5.50	920
2.25	18.2	3.05	100	4.00	395	5.60	955
2.30	20.6	3.10	109	4.10	430	5.70	990
2.35	23.3	3.15	119	4.20	465	5.80	1,025
2.40	26.4	3.20	129	4.30	500	5.90	1,060

NOTE. The above table is applicable only for open-channel conditions. It is based on sixty-t discharge measurements made during 1905-6 and is well defined between gage heights 1.65 feet and feet. Above gage height 3.5 feet the rating curve is a tangent, the difference being 35 per tenth.

Daily discharge, in second-feet, of Westfield Little River near Blandford, Mass., for 1905

Day.	1905.				1906.				
	Aug.	Sept.	Oct.	Nov.	Apr.	May.	June.	July.	Au
1	220	31.5	21.7	25.1	339	76.5	85.0	92.4	
2	100	33.8	21.7	25.1	203	69.8	61.1	48.9	
3	69.8	423	40.9	23.3	147	90.9	49.9	35.5	
4	51.0	832	30.7	58.7	147	79.3	40.0	93.9	
5	30.7	518	25.8	40.9	339	71.1	41.9	46.8	
6	21.7	255	22.8	51.0	563	68.5	88.0	29.9	
7	30.7	141	20.6	62.3	272	79.3	73.8	23.9	
8	27.1	92.4	19.6	51.0	180	69.8	58.7	19.6	
9	26.4	69.8	19.6	41.9	196	97.0	46.8	16.9	
10	20.6	51.0	18.2	38.1	538	121	57.6	17.8	
11	25.1	42.8	17.8	32.2	745	92.4	58.7	17.8	
12	23.9	276	203	30.7	545	76.5	36.4	15.6	
13	17.8	272	89.4	29.2	364	61.1	27.1	12.6	
14	13.6	155	59.9	29.2	300	48.9	20.6	10.9	
15	29.2	85.0	42.8	[a] 35.5	1,060	29.2	16.4	9.8	

[a] Anchor ice in river.

scharge, in second-feet, of Westfield Little River near Blandford, Mass., for 1905-6—Continued.

Day.	1905.				1906.				
	Aug.	Sept.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.
.....	85.0	67.3	34.7	[a] 33.	706	19.6	33.0	8.7	.....
.....	64.7	64.7	33.8	31.5	322	17.3	83.6	16.9	.....
.....	36.4	92.4	32.2	29.9	244	14.8	105	25.1	.....
.....	22.8	93.9	30.7	26.4	183	13.3	93.9	16.9	.....
.....	18.7	77.9	129	[a] 33.8	164	14.0	66.0	14.0	.....
.....	15.6	89.4	85.0	[a] 42.8	134	13.3	49.9	14.0	.....
.....	14.4	69.8	56.5	[a] 42.8	115	12.2	38.1	12.2	.....
.....	12.2	51.0	41.9	[a] 42.8	141	11.2	28.5	13.6	.....
.....	11.6	40.9	42.8	33.8	141	12.2	38.1	15.2	.....
.....	64.7	35.5	42.8	33.8	117	18.7	29.2	12.9	.....
.....	40.9	29.2	36.4	32.2	102	16.4	23.9	9.2	.....
.....	27.8	29.2	30.7	32.2	88.0	38.1	19.2	9.2	.....
.....	24.5	27.8	28.5	161	76.5	210	16.0	20.6	.....
.....	33.0	23.9	26.4	227	67.2	426	13.3	32.2	.....
.....	51.0	23.9	26.4	180	88.0	213	12.9	85.0	.....
.....	39.9	.....	24.5	.....	.....	123	.....	39.0	.....

[a] Anchor ice in river.

scharge, in second-feet, of Westfield Little River near Blandford, Mass., 1906, as determined by weir and by current-meter ratings.

r.	Aug.			Sept.			Oct.			Nov.			Dec.
	Weir.	Current meter.	Per cent difference.	Weir.	Current meter.	Per cent difference.	Weir.	Current meter.	Per cent difference.	Weir.	Current meter.	Per cent difference.	Weir.
.....	.....	.....	.....	5.42	5.8	+ 7	18.9	18.7	− 1	21.5	23.3	+ 8	46.0
.....	.....	.....	.....	4.86	4.8	− 1	16.5	15.2	− 8	20.5	21.1	+ 3	29.0
.....	.....	.....	.....	7.81	8.0	+ 2	13.3	11.9	−12	19.4	20.1	+ 3	27.0
.....	.....	.....	.....	7.81	8.7	+11	11.9	10.3	−16	17.2	16.4	− 5	31.0
.....	.....	.....	.....	6.58	7.3	+11	9.11	8.2	−11	16.3	15.6	− 4	32.0
.....	.....	.....	.....	5.42	5.8	+ 7	7.81	7.3	− 7	16.3	15.2	− 7	57.8
.....	.....	.....	.....	4.86	4.8	− 1	10.5	9.0	−17	15.8	14.4	−10	65.4
.....	.....	.....	.....	4.33	4.4	+ 2	9.11	8.0	−14	16.1	12.9	−25	84.0
.....	.....	.....	.....	3.82	4.1	+ 7	10.5	9.8	− 7	15.0	12.9	−16	95.4
.....	21.5	23.9	+11	3.32	3.9	+17	56.6	67.3	+ 9	13.3	11.6	−15	81.5
.....	19.8	22.8	+15	2.85	3.6	+26	33.0	40.9	+24	22.6	19.6	−15	89.6
.....	18.1	17.8	− 2	4.33	4.6	+ 6	25.2	30.7	+22	36.1	33.8	− 7	107
.....	12.6	15.2	+20	5.42	5.2	− 4	19.8	19.6	− 1	38.5	35.5	− 8	98.3
.....	11.9	11.6	− 3	3.82	4.4	+15	17.3	12.9	−34	31.6	31.5	0	76.0
.....	10.5	10.6	+ 1	3.32	3.7	+11	11.9	10.9	− 9	28.3	25.8	−10	70.5
.....	9.11	9.8	+ 7	2.85	3.1	+ 8	11.9	10.3	−15	29.0	24.5	−18	116
.....	7.81	8.0	+ 2	2.85	3.1	+ 8	10.5	9.2	−14	26.1	22.8	−14	116
.....	7.81	8.2	+ 5	2.40	2.8	+17	11.9	11.6	− 3	56.6	53.1	− 6	78.7
.....	6.58	6.9	+ 5	2.40	2.8	+17	11.9	11.2	− 6	[a] 367	367	0	53.1
.....	5.42	6.0	+11	4.33	4.6	+ 6	[a] 297	297	0	193	234	+21	57.8
.....	26.1	30.7	+17	25.2	22.8	−10	150	167	+11	128	139	+ 8	104
.....	17.3	16.0	− 8	31.0	27.8	−11	84.0	86.5	+ 3	122	139	+14	101
.....	11.2	10.9	− 3	35.0	38.1	+ 9	60.3	56.5	− 7	86.8	93.9	+ 8	98.3
.....	13.3	14.0	+ 5	14.9	13.6	−10	44.8	42.8	− 5	65.4	72.5	+10	116
.....	10.5	9.8	− 7	11.2	10.3	− 9	86.8	82.2	− 5	50.7	49.9	− 2	106
.....	7.81	8.7	+11	9.11	8.7	− 5	77.4	80.7	+ 4	46.0	46.8	+ 2	96.8
.....	7.20	8.0	+11	13.3	10.3	−29	53.1	54.2	+ 2	44.8	46.8	+ 4	86.8
.....	18.9	18.7	− 1	9.11	9.0	− 1	41.5	44.8	+ 8	46.0	46.8	+ 2	82.8
.....	11.9	11.9	0	10.5	9.8	− 7	35.0	37.3	+ 6	39.3	39.0	− 1	82.8
.....	9.11	9.0	− 1	25.2	25.1	0	31.0	29.2	− 6	41.5	42.8	+ 3	89.6
.....	6.58	7.8	+18	.....	.....	.....	29.0	27.8	− 4	.....	.....	.....	102
n.....	12.3	13.0	+ 5	9.1	9.0	− 1	42.2	42.9	+ 2	55.7	57.6	+ 3	.....

rge over weir made same as current meter station discharge. Original maximum values for d 290 for October and November, respectively. See gage-height table footnote.

Monthly discharge of Westfield Little River near Blandford, Mass., for 1905–6.

[Drainage area, 43 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
August	220	11.6	41.0	0.953	1.1[illegible]
September	832	23.9	136	3.16	1.3[illegible]
October	203	17.8	43.8	1.02	1.1[illegible]
November	227	23.3	51.9	1.21	1.3[illegible]
1906.					
April	1,060	67.2	288	6.70	7.[illegible]
May	426	11.2	74.3	1.73	1.9[illegible]
June	105	12.9	47.1	1.10	1.2[illegible]
July	93.9	8.7	27.0	.628	.7[illegible]
August	69.8	6.0	17.4	.405	.4[illegible]
September	38.1	2.8	9.0	.209	.2[illegible]
October	297	7.3	42.9	.998	1.1[illegible]
November	367	11.6	57.6	1.34	1.[illegible]

Monthly discharge (by weir) of Westfield Little River near Blandford, Mass., for 1906.

[Drainage area, 43 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
August (10–31)	26.1	5.42	12.3	0.286	0.3[illegible]
September	35.0	2.40	9.1	.212	.2[illegible]
October	297	7.81	42.2	.981	1.1[illegible]
November	367	13.3	55.7	1.30	1.6
December	162	27.0	81.9	1.90	2.1[illegible]

SALMON RIVER AT LEESVILLE, CONN.

This station was established March 28, 1905, at the plant of the East Haddam Electric Light Company at Leesville, a short distance above the bridge on the highway leading from Leesville to Easthampton. It is maintained through the cooperation of Messrs. Ransom & Hoadley, of Providence, R. I., who expect to build at this point a dam about 72 feet in height for developing light and power, which will probably be used in Hartford. The conditions at the station and the bench marks are described in Water-Supply Paper No. 165, page 144, where are given also references to publications that contain data for previous years.

Discharge measurements of Salmon River at Leesville, Conn., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 28[a]	Barrows and Norcross	120	112	1.34	1[illegible]
May 16[a]	T. W. Norcross	122	121	1.38	1[illegible]
May 26[a]	do	98	82	.70	[illegible]
December 5[b c]	do	102	400	1.97	[illegible]
1906.					
March 9[b]	T. W. Norcross	103	408	2.25	4[illegible]

[a] By wading; meter on a rod.
[b] From downstream side of highway bridge.
[c] About one-eighth of discharge estimated.

Daily gage height, in feet, of Salmon River at Leesville, Conn., for 1905–6.

Day.	1905.		1906.			Day.	1905.		1906.		
	Apr.	May.	Jan.	Feb.	Mar.		Apr.	May.	Jan.	Feb.	Mar.
.....	.....	1.25	1.85	1.8	2.4	17.....	1.65	1.25	2.3	1.75	.....
.....	.....	1.15	1.6	1.7	1.65	18.....	1.62	1.15	2.2	1.7	.....
.....	.....	1.14	1.65	1.7	4.8	19.....	1.62	1.05	1.9	1.7	.....
.....	.....	1.10	3.3	1.6	4.4	20.....	1.55	.95	2.0	1.75	.....
.....	.....	1.08	2.35	1.6	3.0	21.....	1.52	.....	2.2	4.4	.....
.....	.....	1.08	2.0	1.6	2.5	22.....	1.70	.....	2.1	3.3	.....
.....	.....	1.04	1.95	1.7	2.35	23.....	1.95	.....	2.2	2.4	.....
.....	.....	1.00	1.65	1.65	2.35	24.....	1.52	.....	2.3	2.1	.....
.....	.....	.90	1.5	1.6	.....	25.....	1.50	.....	2.3	2.0	.....
.....	.....	.90	1.65	1.7	.....	26.....	1.40	.....	2.0	2.0	.....
.....	.....	.95	1.55	1.65	.....	27.....	1.40	.....	1.95	1.95	.....
.....	.....	1.10	1.75	1.65	.....	28.....	1.35	.....	2.0	2.0	.....
.....	.....	1.28	1.75	1.65	.....	29.....	1.29	.....	1.85	.....	.....
.....	.....	1.35	1.75	1.65	.....	30.....	1.25	.....	1.85	.....	.....
.....	.....	1.65	1.75	1.75	.....	31.....	.....	.....	1.8	.....	.....
.....	.....	1.38	3.00	1.7	.....						

TE.—River did not freeze over during periods of observation, 1905 and 1906.
ge heights for April and May, 1905, are the mean of two readings, morning and evening.
ring January to March, 1906, the gage was read once a day, at midnight.

Rating table for Salmon River at Leesville, Conn., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	98	1.70	250	2.50	510	3.60	940
1.00	112	1.80	280	2.60	545	3.80	1,020
1.10	128	1.90	310	2.70	580	4.00	1,100
1.20	144	2.00	340	2.80	620	4.20	1,180
1.30	161	2.10	370	2.90	660	4.40	1,260
1.40	180	2.20	405	3.00	700	4.60	1,340
1.50	200	2.30	440	3.20	780	4.80	1,420
1.60	225	2.40	475	3.40	860		

TE.—The above table is applicable only for open-channel conditions. It is based on five dis-
ge measurements made during 1905–6, and is well defined below gage height 2.2 feet. Above gage
it 3 feet the rating curve is a tangent, the difference being 40 per tenth.

Monthly discharge of Salmon River at Leesville, Conn., for 1905–6.

[Drainage area, 115 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
(17–30)	325	152	210	1.83	0.95
(1–20)	237	98	136	1.18	.88
st (3–31)	111	72	82.9	.721	.78
mber	712	85	181	1.57	1.75
ber	282	64	124	1.08	1.24
mber	430	97	130	1.13	1.26
uber	640	149	292	2.54	2.93
1906.					
ary	820	200	348	3.03	3.49
uary	1,260	225	328	2.85	2.97
h (1–8)	1,420	237	690	6.00	1.79

TE.—Values for 1905 and 1906 are approximate. Daily discharges, August to December, 1905, are
l on the averages of three gage readings per day.

Monthly discharge of Westfield Little River near Blandfo H.

[Drainage area, 43 square miles

Month.	Discharge i	
	Maximum	
1905.		
August		
September		
October		
November		
1906.		
April		
May		
June		
July		
August		
September		
October		
November		

Monthly dischar

,6, from the highway
ance from water surface
ng the top of guard railing
the left abutment.

harge, 230 second-feet.

, AT FARMINGTON, CONN.

ble October 27, 1906, from the highway
distance above the electric railway bridge
The bench mark is the top of guard railing
the end of the inclined end post on the left
side of bridge, the distance to water surface

471 square feet; discharge, 902 second-feet.

HOUSATONIC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Augu
Sept
Oct
No
De

Housatonic River has its source in Berkshire County, Mass. It *flows southward* across Massachusetts and the west end of Con- *necticut*, entering Long Island Sound. Its course is nearly parallel to *the eastern* boundary of New York State, and it receives the drainage *from Tenmile* River in New York.

Tenmile River drains an area of diversified topography, including *broad flats* and marshes in the basin of Swamp River and extensive *areas under* cultivation and sparsely timbered hills in the region of *the Chestnut* Range. The drainage area lies chiefly in New York *State*, the stream crossing the line into Connecticut one-half mile *above* the junction with the Housatonic.

HOUSATONIC RIVER AT GAYLORDSVILLE, CONN.

This station was established October 24, 1900. It is located at the covered wooden highway bridge at Gaylordsville, 2 miles below the mouth of Tenmile River. The conditions are described in Water-Supply Paper No. 165, page 145, where are given also references to publications that contain data for previous years. The bench mark is a large spike in a notch on the river and highway side of a large cottonwood tree, about 150 feet from right hand end of bridge, along road to New Milford; elevation, 28.97 feet. The reference point is the top of three nails at the 1-foot mark on the gage board; elevation, 29.66 feet. Elevations refer to gage datum.

ment was made October 17, 1906, by C. C. Covert, with
sults:

, 373 square feet; gage height, 3.55 feet; discharge, 654 second-

of Housatonic River at Gaylordsville, Conn., for 1906.

			Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		4.50	6.40	5.24	5.19	3.99	4.44	3.78	3.78	4.00	4.10
	4.55	4.55	6.00	5.19	5.19	4.19	4.14	3.73	3.73	3.80	4.05
	4.15	4.70	5.80	5.09	4.89	5.04	3.99	3.58	3.63	3.85	3.90
4.65	4.15	8.45	5.55	4.94	4.84	4.84	4.29	3.48	3.33	3.90	3.70
5.10	4.15	7.10	5.70	4.99	4.54	4.74	4.14	3.63	3.28	3.70	3.00
5.05	4.05	6.55	6.10	4.94	4.99	4.54	3.64	3.18	3.43	3.55	3.95
4.70	4.15	6.45	6.25	5.04	5.09	4.34	3.39	3.18	4.08	3.50	4.35
4.35	4.20	5.75	6.00	4.84	4.74	4.44	3.89	3.23	3.78	3.60	4.00
4.35	4.15	5.45	5.95	5.04	4.59	4.34	4.24	3.08	3.18	3.60	4.15
4.05	4.15	5.25	6.95	5.39	5.19	3.99	4.19	3.63	2.98	3.55	4.05
4.30	4.20	5.20	7.55	5.34	5.19	4.04	4.14	3.03	3.60	3.75	4.10
4.25	4.15	5.05	6.95	5.24	5.04	4.34	4.44	3.33	3.70	4.25	3.85
4.35	4.05	5.00	6.50	4.69	4.74	4.09	4.24	3.38	3.70	4.15	4.15
4.90	4.15	4.95	6.65	4.89	4.49	3.64	3.84	3.43	3.65	4.10	4.10
4.80	4.15	4.85	6.70	4.94	4.24	3.74	3.79	3.23	3.55	4.00	4.10
4.85	4.15	4.50	8.05	4.99	4.29	3.69	3.59	3.03	3.40	4.00	4.55
5.10	4.25	4.65	7.85	4.74	5.09	3.64	3.74	3.23	3.35	4.00	4.50
4.95	4.25	4.45	7.85	4.64	5.04	3.24	3.44	3.23	3.20	4.10	4.10
4.90	4.05	4.35	7.20	4.44	4.74	3.24	3.09	2.98	3.15	4.40	3.95
4.75	3.85	4.45	6.80	4.44	4.54	3.49	3.34	3.23	4.30	4.50	4.00
4.65	4.20	4.45	6.40	4.49	4.59	3.94	3.59	3.48	5.10	4.95	4.25
4.95	6.35	4.60	6.05	4.29	4.59	3.74	3.34	3.88	4.80	4.80	4.20
5.35	6.30	4.55	6.00	4.39	4.54	3.89	3.79	3.98	4.70	4.55	4.05
5.50	5.95	4.55	6.15	4.44	4.44	3.84	3.94	3.68	4.50	4.20	3.80
5.65	5.50	4.25	6.05	4.34	4.19	3.94	3.94	3.68	4.50	4.40	3.95
5.35	5.80	4.35	5.85	4.29	4.24	3.74	3.34	3.68	4.45	4.30	3.85
5.25	5.15	5.00	5.65	4.21	4.14	3.64	3.34	3.63	4.30	4.25	3.70
5.00	4.80	7.00	5.45	5.84	4.04	4.04	3.89	3.88	4.25	4.05	4.00
4.75	.....	7.00	5.25	6.54	4.14	3.79	4.04	3.73	4.00	4.00	4.00
4.40	.....	6.75	5.45	6.34	4.04	4.44	4.19	3.78	3.85	4.15	4.05
4.50	.....	6.75	.....	5.74	.....	4.44	3.99	.....	4.05	.....	4.35

RE.—The following ice conditions prevailed during 1906: January 8, ice along banks; February 3, eddy; February 6, ice in river—anchor ice running; February 22, ice went out 9.30 a. m.; February in eddy; March 15, ice in eddy above gorge; March 26, ice went out; December 4, ice in river.
river seldom freezes over at gage, but jams of needle ice form on rifts below and cause backwater nes. Discharges have been computed as if open-channel conditions existed. It is believed that will introduce little serious error.
chain length was last checked in July, 1904, hence all gage heights may be subject to some constant

Rating table for Housatonic River at Gaylordsville, Conn., for 1900–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.90	266	4.10	986	5.30	2,548	7.00	6,180
3.00	303	4.20	1,082	5.40	2,714	7.20	6,700
3.10	352	4.30	1,178	5.50	2,880	7.40	7,220
3.20	402	4.40	1,274	5.60	3,076	7.60	7,740
3.30	451	4.50	1,370	5.70	3,272	7.80	8,272
3.40	501	4.60	1,506	5.80	3,468	8.00	8,800
3.50	550	4.70	1,642	5.90	3,664	8.20	9,340
3.60	618	4.80	1,778	6.00	3,860	8.40	9,880
3.70	686	4.90	1,914	6.20	4,300	8.60	10,430
3.80	754	5.00	2,050	6.40	4,740		
3.90	822	5.10	2,216	6.60	5,204		
4.00	890	5.20	2,382	6.80	5,692		

E.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1900–1906 and is well defined between gage heights 3 feet and 5 feet.

Monthly discharge of Housatonic River at Gaylordsville, Conn., for 1906.

[Drainage area, 1,030 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq mile.	Depth in inches.
January	3,170	938	1,800	1.76	2.0
February	4,630	788	1,630	1.60	1.6
March	10,000	1,130	2,910	2.85	3.2
April	8,930	2,460	4,780	4.69	5.2
May	5,060	1,080	2,110	2.07	2.3
June	2,370	928	1,630	1.60	1.8
July	2,120	421	984	.965	1.1
August	1,310	347	818	.802	.9
September	876	296	554	.543	.6
October	2,220	296	861	.844	.9
November	1,980	550	992	.973	1.0
December	1,440	686	958	.939	1.0
The year	10,000	296	1,670	1.64	22.7

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Monthly discharge of Housatonic River at Gaylordsville, Conn., for 1906.

[Drainage area, 1,020 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq mile.	Depth in inches.
January	3,170	938	1,800	1.76	2.03
February	4,630	788	1,630	1.60	1.67
March	10,000	1,130	2,910	2.85	3.28
April	8,930	2,460	4,780	4.69	5.23
May	5,060	1,090	2,110	2.07	2.38
June	2,370	928	1,630	1.60	1.78
July	2,120	421	984	.965	1.11
August	1,310	347	818	.802	.92
September	876	296	554	.543	.61
October	2,220	296	861	.844	.97
November	1,980	550	992	.973	1.09
December	1,440	686	958	.939	1.08
The year	10,000	296	1,670	1.64	22.17

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THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

JULY, 1907.

O

Water-Supply and Irrigation Paper No. 202 Series P, Hydrographic Progress Reports, 56

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY
OF
HUDSON, PASSAIC, RARITAN, AND DELAWARE RIVER DRAINAGES

1906

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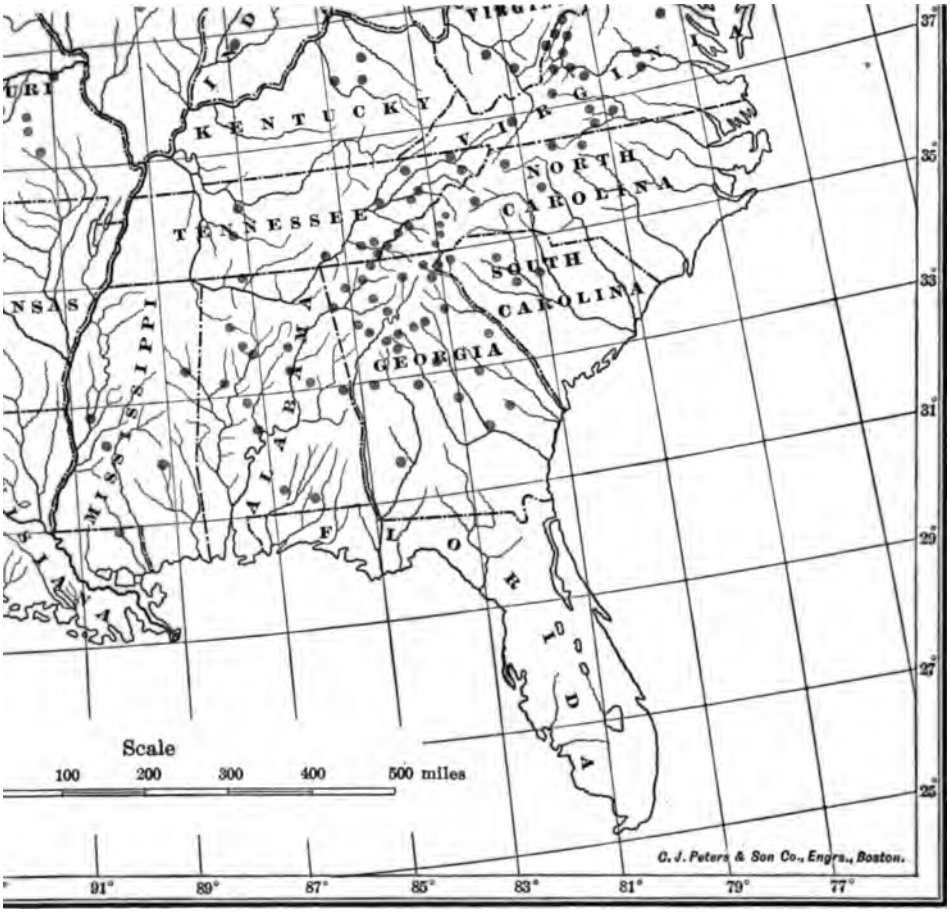


TIONS MAINTAINED DURING 1906.

E WATER SUPPLY OF THE HUDSON, PASSAIC, RARITAN, AND DELAWARE RIVER DRAINAGES, 1906.[a]

H. K. Barrows and N. C. Grover,
District Hydrographers.[b]

INTRODUCTION.

SCOPE OF WORK.

vater supply of the United States is of more importance to the l pursuits of the people than is any other natural resource. ırid States the limit of agricultural development is determined amount of water available for irrigation; while in all parts of ntry the increase in the population of cities and towns makes ry additional water supplies for domestic and industrial uses, uring which both the quantity and the quality of the water ıy be obtained must be considered. The location of manufac- plants may depend largely on the water-power facilities and character of the water. The notable advances made in the transmission of power have led to the utilization of water for the operation of manufacturing establishments, railroads, ınicipal lighting plants, many of which are at some distance ıe places at which the power is developed.

intelligent establishment and maintenance of enterprises or ies that depend on the use of water demand a thorough dge of the flow of the streams and an understanding of the ›ns affecting that flow. This knowledge should be based on ıowing both the total flow and the distribution of the flow ıout the year, in order that normal fluctuations may be pro- or. As the flow of a stream is variable from year to year,

rk in New York was under the direction of Mr. R. E. Horton for the first half of the year. ı last half of the year it was under the direction of Mr. H. K. Barrows, and assistance was ıroughout the year by C. C. Covert. The work outside of New York State was carried on lirection of Mr. N. C. Grover, assisted by members of the computing section.

tations were made and the data prepared for publication under the direction of John C. sted by R. H. Bolster, F. F. Henshaw, Robert Follansbee, and H. D. Padgett.

estimates of future flow can be made only from a study of observations covering several years. The rapid increase in the development of the water resources of the United States has caused a great demand by engineers for information in regard to the flow of streams, as it is now generally realized that the failure of many large power, irrigation, and other projects has been due to the fact that the plans were made without sufficient trustworthy information in respect to the water supply.

Owing to the broad scope of these hydrographic investigations and the length of time they should cover in order that the records may be of greatest value, it is in general impossible for private individuals to collect the necessary data, and as many of the streams traverse more than one State this work does not properly fall within the province of the State authorities. The United States Geological Survey has therefore, by means of specific appropriations by Congress, for several years systematically made records of stream flow, with the view of ultimately determining all the important features governing the flow of the principal streams of the country. In carrying out this plan stations are established on the streams and maintained for a period long enough to show their regimen or general behavior. When a record that is sufficient for this purpose has been obtained for any stream the work on that stream is discontinued. The order in which the streams are measured is determined by the degree of their importance.

During 1906 the regimen of flow was studied at about 700 stations distributed along the various rivers throughout the United States, as shown on Pl. I. In addition to these records data in regard to precipitation, evaporation, water power, and river profiles were obtained in many sections of the country.

These data have been assembled by drainage areas, and are published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 201 to 214, inclusive, each of which pertains to the surface water resources of a group of adjacent areas. In these papers are embodied not only the data collected in the field, but also the results of computations based on these data, and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc. The list follows:

Water-Supply and Irrigation Papers on Surface Water Supply, 1906.

201. Surface water supply of New England, 1906 (Atlantic coast of New England drainage).
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river drainages, 1906.

3. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.)
4. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers and eastern Gulf of Mexico drainages.)
5. Surface water supply of the Ohio and lower eastern Mississippi river drainages, 1906.
6. Surface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
7. Surface water supply of the upper Mississippi River and Hudson Bay drainages, 1906.
8. Surface water supply of the Missouri River drainage, 1906.
9. Surface water supply of the lower western Mississippi River drainage, 1906.
10. Surface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
11. Surface water supply of the Colorado River drainage above Yuma, 1906.
12. Surface water supply of the Great Basin drainage, 1906.
13. Surface water supply of California, 1906. (The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage below Yuma.)
14. Surface water supply of the North Pacific Coast drainage, 1906.

The records at most of the stations discussed in these reports tend over a series of years. An index of the reports containing ch records up to and including 1903 has been published in Water-pply Paper No. 119. The following table gives, by years and imary drainage basins, the numbers of the papers on surface water pply published from 1901 to 1906:

umbers of Water-Supply Papers containing results of stream measurements, 1901-1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
antic coast of New England drainage	65 75	82	97	124	165	201
dson, Passaic, Raritan, and Delaware river drainages	65 75	82	97	125	166	202
squehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages	65 75	82 83	97 98	126	167	203
ntee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages	65 75	83	98	127	168	204
io and lower eastern Mississippi river drainages	65 75	83	98	128	169	205
eat Lakes and St. Lawrence River drainages	65	83	97	129	170	206
dson Bay and upper eastern and western Mississippi River drainages	65 66 75	83 84 85	98 99 100	128 130	171	207
ssouri River drainage	66 75	84	99	130 131	172	208
ramec, Arkansas, Red, and lower western Mississippi river drainages	66 75	84	99	131	173	209
stern Gulf of Mexico and Rio Grande drainages	66 75	84	99	132	174	210
lorado River drainage above Yuma	66 75	85	100	133	175	211
e Great Basin drainage	66 75	85	100	133	176	212
e Great Basin and Pacific Ocean drainages in California and olorado River drainage below Yuma	66 75	85	100	134	177	213
rth Pacific Coast drainage	66 75	85	100	135	178	214

Reports containing data for years prior to 1901 are noted in the series list at the end of this paper.

DEFINITIONS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West, and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot: One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.

6. Tables showing discharge and horsepower and the number of ays during the year when the same are available.

The descriptions of stations give such general information about the ocality and equipment as would enable the reader to find and use the ation, and they also give, as far as possible, a complete history of all ie changes that have occurred since the establishment of the station iat would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge ieasurements made during the year, including the date, the name of he hydrographer, the width and area of cross section, the gage height, nd the discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the urface of the river as found from the mean of the gage readings taken ach day. The gage height given in the table represents the elevation f the surface of the water above the zero of the gage. At most stadions the gage is read in the morning and in the evening.

The discharge measurements and gage heights are the base data rom which the other tables are computed. In cases of extensive evelopment it is expected that engineers will use these original data i making their calculations, as the computations made by the Surey are based on the data available at the time they are made and iould be reviewed and, if necessary, revised when additional data e available.

The rating table gives the discharge in second-feet corresponding to arious stages of the river as given by the gage heights. It is pubshed to enable engineers to determine the daily discharge in case this formation is desired.

In the table of monthly discharge the column headed "Maximum" ves the mean flow for the day when the mean gage height was highst, and it is the flow as given in the rating table for that mean gage eight. As the gage height is the mean for the day, there might have een short periods when the water was higher and the corresponding ischarge larger than given in this column. Likewise in the column " "Minimum" the quantity given is the mean flow for the day when ie mean gage height was lowest. The column headed "Mean" is ie average flow for each second during the month. Upon this the mputations for the remaining columns, which are defined on page 4, e based.

The values in the table of monthly discharge are intended to give ly a general idea of the conditions of flow at the station, and it is not pected that they will be used for other than preliminary estimates.

In most work where data in regard to flow are used the regimen of w is of primary importance. Therefore for the principal stations bles have been prepared showing the horsepower that can be

developed at various rates of flow, and the length of time that these rates of flow and the corresponding horsepower are available. These tables have been prepared on a basis of 80 per cent efficiency on the turbines, and the horsepower per foot of fall is given in order that the reader can determine the horsepower for any fall.

In the computations, sufficient significant figures have been used so that the percentage of error in the tables will not in general exceed 1 per cent. Therefore, most of the values in the tables are given to only three significant figures. In making the various computations, Thatcher's slide rule, Crelle's tables, and computation machines have been generally used.

In order to give engineers an idea of the relative value of the various data, notes in regard to accuracy are given as far as possible. The accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data.

In the accuracy notes the following terms have been used, indicating the probable accuracy, in per cent, of the mean monthly flow. As these values are mean values, the error in the value for the flow of any individual day may be much larger.

Excellent indicates that the mean monthly flow is probably accurate to within 5 per cent; good, to within 10 per cent; fair, to within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet, or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.

second-foot for one 30-day month equals 59.50 acre-feet.
second-foot for one 31-day month equals 61.49 acre-feet.
0 California miner's inches equal 15.7 United States gallons per second.
0 California miner's inches equal 96.0 Colorado miner's inches.
0 California miner's inches for one day equal 4.96 acre-feet.
0 Colorado miner's inches equal 2.60 second-feet.
0 Colorado miner's inches equal 19.5 United States gallons per second.
0 Colorado miner's inches equal 104 California miner's inches.
0 Colorado miner's inches for one day equal 5.17 acre-feet.
0 United States gallons per minute equal 0.223 second-foot.
0 United States gallons per minute for one day equal 0.442 acre-foot.
000,000 United States gallons per day equal 1.55 second-feet.
000,000 United States gallons equal 3.07 acre-feet.
000,000 cubic feet equal 22.95 acre-feet.
acre-foot equals 325,850 gallons.
inch deep on 1 square mile equals 2,323,200 cubic feet.
inch deep on 1 square mile equals 0.0737 second-foot per year.
foot equals 0.3048 meter.
mile equals 1.60935 kilometers.
mile equals 5,280 feet.
acre equals 0.4047 hectare.
acre equals 43,560 square feet.
acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1⅓ horsepower equal about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water-wheel, realizing 80 per cent of theoretical power.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geological Survey) and No. 95 (Accuracy of Stream Measurements). In order that those who use this report may readily become acquainted with the general methods employed, the following brief descriptions are given:

Streams may be divided, with respect to their physical conditions, into three classes: (1) Those with permanent beds; (2) those with beds which change only during extreme low or high water; (3) those with constantly shifting beds. In determining the daily flow, special methods are necessary for each class. The data upon which these

determinations are based and the method of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir; (3) by measurements of the velocity of the current and the area of the cross section. The method chosen for any case depends upon the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v=c\sqrt{Rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The results obtained by the slope method are, in general, only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir method.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining the flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable measurements of flow. The conditions necessary to insure good results may be divided into two classes—(1) those relating to the physical characteristics of the dam itself, and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q=c\,b\,h^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Papers Nos. 180 and 200[a]); (*f*) either no flashboards or exceptional care in reducing leakage through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, the dam is built for purposes of power or navigation, and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such determinations of

[a] Water-Supply Paper No. 200 replaces No. 150, the edition of which has been exhausted.

v, the amount of water diverted should be reasonably constant. rthermore, it should be so diverted that it can be measured, either a weir, a current meter, or a simple system of water wheels which of standard make or which have been rated as meters under work-conditions and so installed that the gate openings, the heads under ich they work, and their angular velocities may be accurately served.

The combination of physical conditions and uses of the water ould be such that the determinations of flow will not involve, for a tical stage of considerable duration, the use of a head on a broad-sted dam of less than 6 inches. Moreover, when all other condi-ns are good the cooperation of the owners or operators of the plant still essential if reliable results are to be obtained.

A gaging station at a weir or dam has the general advantage of con-uity of record through the period of ice and floods and the disad-ntages of uncertainty of coefficient to be used in the weir formula d of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water flow-past a certain section of a stream at a given time is termed a dis-arge measurement. This quantity is the product of two factors—mean velocity and the area of the cross section. The mean ocity is a function of surface slope, wetted perimeter, roughness of l, and the channel conditions at, above, and below the gaging sec-n. The area depends on the contour of the bed and the fluctu-ons of the water surface. The two principal ways of measuring velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging stations determining discharge by velocity measurements, in order that the ta may have the required degree of accuracy. Their essential uirements are practically the same, whether the velocity is deter-ned by meters or floats. They are located as far as possible where channel is straight both above and below the gaging section; ere there are no cross currents, backwater, or boils; where the bed the stream is reasonably free from large projections of a permanent racter, and where the banks are high and subject to overflow only flood stages. The station must be so far removed from the effects ributary streams and of dams or other artificial obstructions that gage height shall be an index of the discharge.

Certain permanent or semipermanent structures, usually referred as equipment, are generally pertinent to a gaging station. These a gage for determining the fluctuations of the water surface, bench rks to which the datum of the gage is referred, permanent marks on bridge or a tagged line indicating the points of measurement, and ere the current is swift some appliance (generally a secondary

cable) to hold the meter in position in the water. As a rule the stations are located at bridges if the channel conditions are satisfactory, as from them the observations can more readily be made and the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In case of flood measurements good results can be obtained by observing the velocity of floating cakes of ice or débris. In case of all surface-float measurements coefficients must be used to reduce the observed velocity to the mean velocity. The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

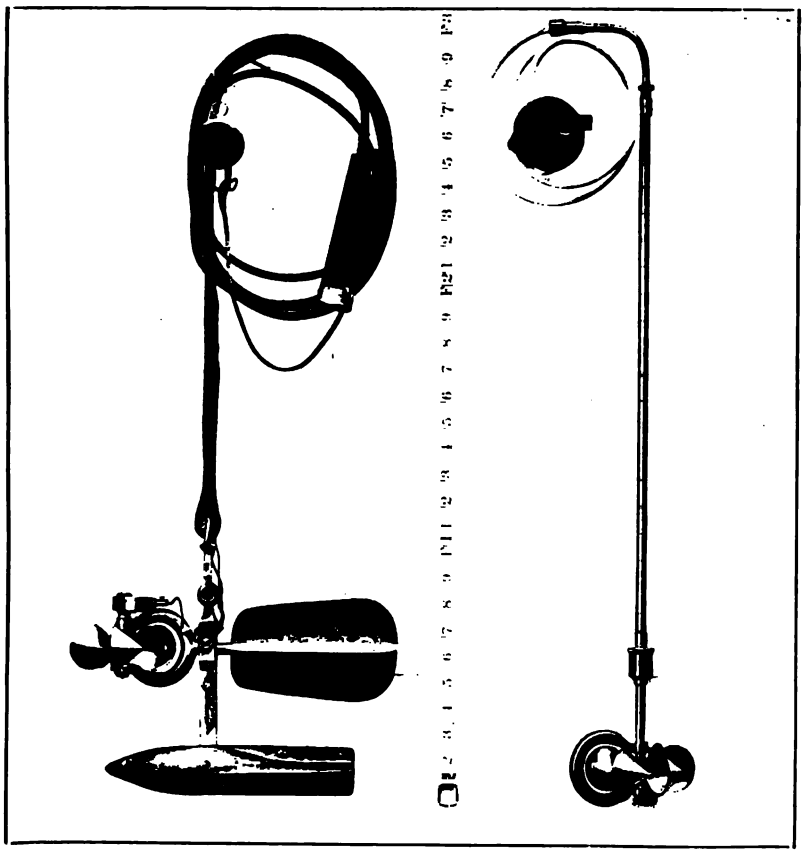
In measuring velocity by a float, observation is made of the time taken by the float to pass over the "run," a selected stretch of river from 50 to 200 feet long. In each discharge measurement a large number of velocity determinations are made at different points across the stream, and from these observations the mean velocity for the whole section is determined. This may be done by plotting the mean positions of the floats, as indicated by the distances from the bank, as ordinates, and the corresponding times as abscissas. A curve through these points shows the mean time of run at any point across the stream, and the mean time for the whole stream is obtained by dividing the area bounded by this curve and its axis by the width. The length of the run divided by the mean time gives the mean velocity.

The area used in float measurements is the mean of the areas at the two ends of the run and at several intermediate sections.

The essential parts of the current meters in use are a wheel of some type, so constructed that the impact of flowing water causes it to revolve, and a device for recording or indicating the number of revolutions. The relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter. This rating is done by drawing the meter through still water for a given distance at different speeds, and noting the number of revolutions for each run. From these data a rating table is prepared which gives the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They may, however, be classed in two general types: Those in which the wheel is made up of a series of cups, as the Price, and those having a screw propeller wheel, as the Haskell. Each meter has been developed for use under some special condition. In the case of the small Price meter, shown in Pl. II, *B*, which has been largely developed and extensively used by the United States Geological Survey, an attempt

A. CURRENT-METER RATING STATION AT LOS ANGELES, CAL.



B. PRICE CURRENT METERS.

een made to get an instrument which could be used under prac-
y all conditions.

rrent-meter measurements may be made from a bridge, a cable, a
or by wading, and gaging stations may be classified in accord-
with such use. Fig. 1 shows a typical cable station.

making the measurement an arbitrary number of points are laid
a line perpendicular to the thread of the stream. The points at
h the velocity and depth are observed are known as measuring
s, and are usually fixed at regular intervals, varying from 2 to 20
depending upon the size and condition of the stream. Perpen-
ars dropped from the measuring points divide the gaging section
strips. For each strip or pair of strips the mean velocity, area,
lischarge are determined independently, so that conditions exist-
one part of the stream may not be extended to parts where they
t apply.

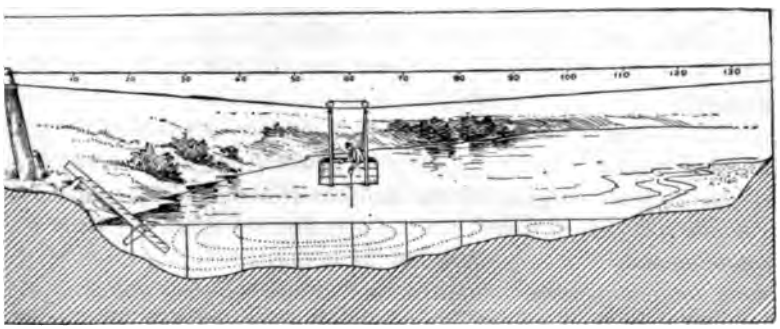


FIG. 1.—Cable station, showing section of river, car, gage, etc.

ree classes of methods of measuring velocity with current meters
general use—multiple-point, single-point, and integration.

e three principal multiple-point methods in general use are the
cal velocity-curve; 0.2 and 0.8 depth; and top, bottom, and mid-
.

the vertical velocity-curve method a series of velocity determi-
ns are made in each vertical at regular intervals, usually from 0.5
foot apart. By plotting these velocities as abscissas and their
s as ordinates, and drawing a smooth curve among the resulting
s, the vertical velocity-curve is developed. This curve shows
ically the magnitude and changes in velocity from the sur-
o the bottom of the stream. The mean velocity in the vertical
en obtained by dividing the area bounded by this velocity-
and its axis by the depth. On account of the length of time
red to make a complete measurement by this method its
s limited to the determination of coefficients for purposes of
arison and to measurements under ice.

ch is observed on the gage, and on the general contour of the bed he stream, which is determined by soundings. The soundings are ally taken at each measuring point at the time of the discharge asurement, either by using the meter and cable or by a special nding line or rod. For streams with permanent beds standard ss sections are usually taken during low water. These sections ve to check the soundings which are taken at the time of the meas-ements, and from them any change which may have taken place in bed of the stream can be detected. They are also of value in taining the area for use in computations of high-water measure-nts, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed ocities and depths at various points of measurement the measuring tion is divided into elementary strips, as shown in fig. 1, and the an velocity, area, and discharge are determined separately for her a single or a double strip. The total discharge and the area are sums of those for the various strips, and the mean velocity is tained by dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, ing to diversity and instability of conditions during the winter riod and also to lack of definite information in regard to the laws of w of water under ice. The method now employed is to make fre-ent discharge measurements during the frozen periods by the 0.2 d 0.8, and vertical velocity-curve methods, and to keep an accu-e record of the conditions, such as the gage height to the surface the water as it rises in a hole cut in the ice, the thickness and aracter of the ice, etc. From these data an approximate estimate the daily flow can be made by constructing a rating curve (really series of curves) similar to that used for open channels, but con-lering, in addition to gage heights and discharge, the varying thick-ss of ice. For information in regard to flow under ice cover see ater-Supply Paper No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of determining run-off, depending on whether or not the bed of the stream is permanent.

For stations on streams with permanent beds the first step in com-ting the run-off is the construction of a rating table, which shows discharge corresponding to any stage of the stream. This rating ble is applied to the record of stage to determine the amount of ter flowing. The construction of the rating table depends upon the thod used in measuring flow.

For a station at a weir or dam the basis for the rating table is some ndard weir formula. The coefficients to be used in its application

In the second multiple-point method the meter is held successively at 0.2 and 0.8 of the depth, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. On the assumption that the vertical velocity-curve is a common parabola with horizontal axis, the mean of the velocities at 0.22 and 0.79 of the depth will give (closely) the mean velocity in the vertical. Actual observations under a wide range of conditions show that this second multiple-point method gives the mean velocity very closely for open-water conditions, and moreover the indications are that it holds nearly as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid-depth, at 0.5 foot below the surface, and at 0.5 foot above the bottom, and the mean velocity is determined by dividing by 6 the sum of the top velocity, 4 times the mid-depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity-curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in a majority of the measurements. A large number of vertical velocity-curve measurements, taken on many streams and under varying conditions, show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of the wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending upon the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is specially adapted for flood measurements or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical-integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river,

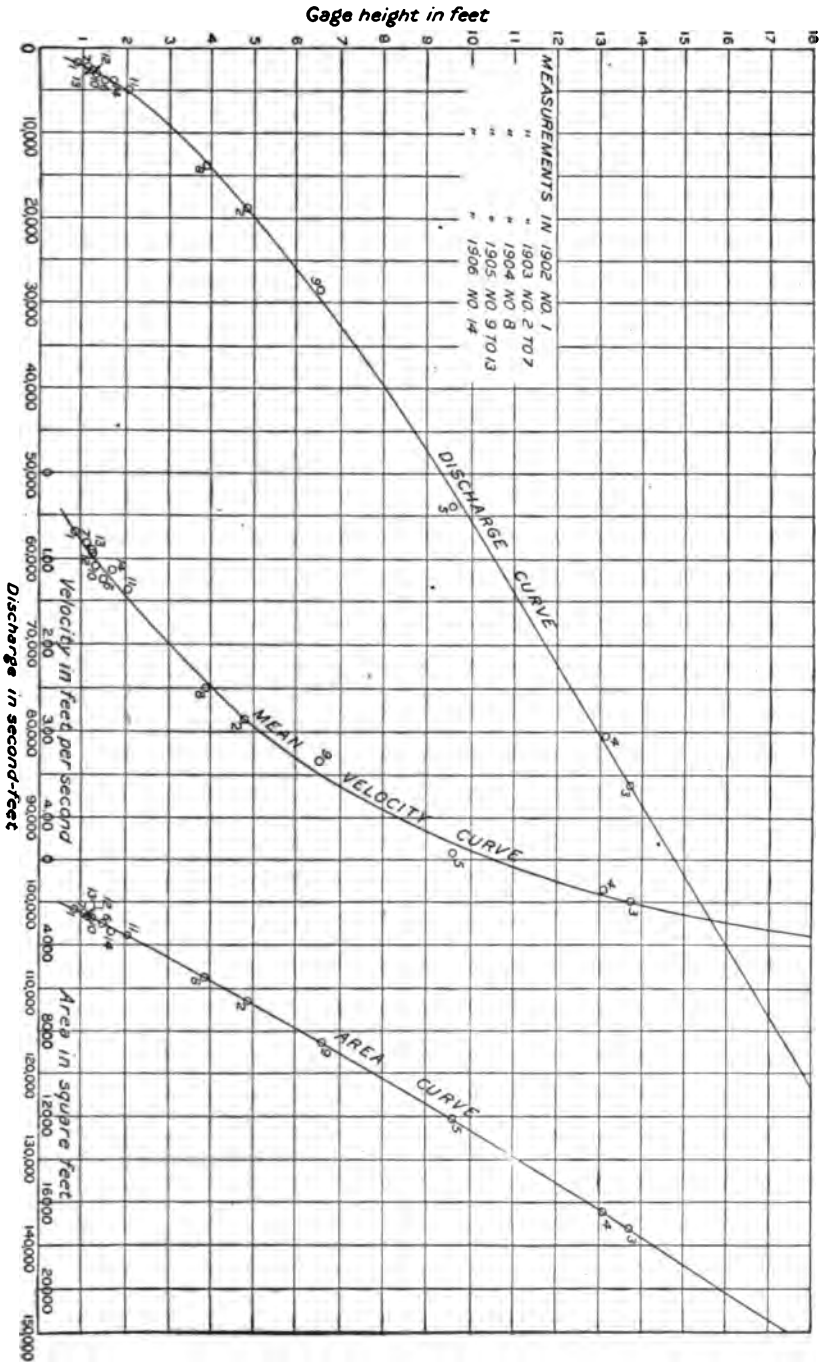


FIG. 2.—Discharge, area, and mean-velocity curves for Potomac River at Point of Rocks, Md.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the determinations of flow are to be other than rough approximations. For stations with beds which shift slowly, or are materially changed only during floods, rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days and the discharge for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report of the United States Geological Survey, Part IV, page 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in determining the flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Assistance has been rendered or records furnished by the following, to whom special acknowledgment is due:

H. C. Allen, special deputy State engineer representing New York State cooperation; E. A. Fisher, city engineer, and J. F. Skinner, principal assistant engineer, Utica Consolidated Water Company, Utica, N. Y.; New York Additional Water Supply Commission, J. Waldo Smith, chief engineer; Carleton E. Davis, assistant engineer.

HUDSON RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The principal sources of Hudson River lie in the wildest portion of the Adirondack Mountains, in Essex County, northeastern New York. A number of branches, any one of which might possibly be considered the main stream, form its upper waters; but if the highest collected *and permanent body* of water be assumed as the true head, then the

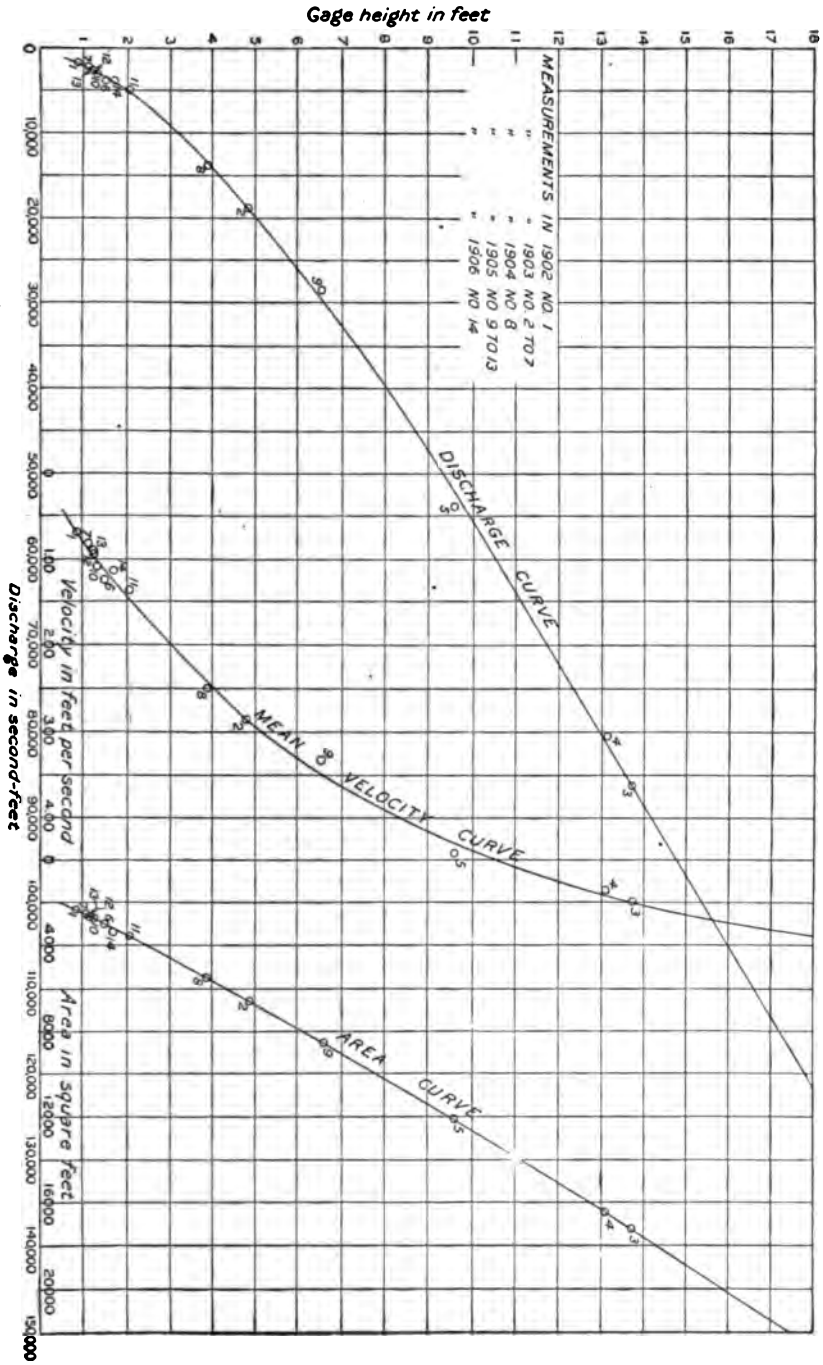


FIG. 2.—Discharge, area, and mean-velocity curves for Potomac River at Point of Rocks, Md.

Above Rome the Mohawk flows through a deep gorge in shale rock; from Rome eastward to Little Falls the valley is deeply filled with alluvial deposits, and the flood plains on either side become submerged during freshets, thus acting to some extent as storage reservoirs. At Little Falls the river cuts through a rocky gorge, whose walls rise precipitously 500 or 600 feet.

Below Rome the fall of the river is small and rather uniform, being made up of long, quiet reaches with slight riffles; but at Little Falls this uniformity is broken, and the stream descends in a succession of falls about 45 feet in less than half a mile. The average fall between Rome and the lower aqueduct at Crescent, a distance of 110.7 miles, is 2.43 feet per mile; thence to the level of slack water above Troy dam there is a further descent of 149.5 feet in 4.4 miles, but of this 105 feet is included in the improved power at Cohoes.

The principal tributaries of the Mohawk below the source are successively, Oriskany, West Canada, East Canada, and Schoharie creeks.

The Erie Canal runs parallel to the Mohawk through most of its course below Rome and derives a part of its water supply from the river. Feeder dams for purposes of diversion are located on the river at Delta, Rome, Little Falls, Rocky Rift, and Rexford Flats. A dam at Oriskany Creek also diverts into the canal a portion of the flow of that tributary, as well as waters brought into the Mohawk basin from storage reservoirs located in the upper drainage basin of Chenango River near Hamilton, N. Y. There is also a diversion dam near the mouth of Schoharie Creek, the largest tributary of the Mohawk.

The annual precipitation in the Hudson River basin, as determined by observations at twelve or more stations, is about 37 inches, but the amount is undoubtedly much greater in the elevated country near the headwaters.

The flow of the upper Hudson is controlled to some extent during the dry season by the use of Indian Lake storage reservoir, and the facilities for storage works in this part of the basin are unsurpassed. The entire region is dotted with ponds and lakes, many of them of large size and fed from extensive drainage areas. Saratoga Lake serves as a regulator of Fish Creek, and there is a small reservoir at the headwaters of the Hoosic. Storage is also extensively developed in the basin of Croton River for the purpose of supplying the city of New York with water. The flow of the Mohawk above the gaging stations at Little Falls and Dunsbach Ferry is modified during the season of canal navigation, extending from about May 1 to December 1.

Except that of the Delaware, the basin of the Hudson contains a greater population in proportion to its size than any other important river basin in the United States. This population is largely concentrated along the great highway of traffic which follows the valley of the Mohawk from the west and then continues down the lower Hudson.

HUDSON RIVER AT FORT EDWARD, N. Y.

is station was established in 1895, in connection with the upper son storage surveys. It is located at the dam of the International r Company. A new and accurate profile of the crest of the dam, ned in 1906, has been used to determine the discharge. The conns at the station are described in the annual reports of the State neer and surveyor of New York, and in Water-Supply Paper 166, page 18, where are given also references to publications that ain data for previous years.

ily discharge, in second-feet, of Hudson River at Fort Edward, N. Y., for 1906.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
...	8,392	9,962	6,343	10,763	12,006	10,837	7,940	3,662	2,175	3,143	3,168	3,843
...	7,569	5,937	5,338	10,532	12,637	7,723	13,065	3,174	3,756	2,738	3,293	5,902
...	5,740	5,586	4,351	10,147	13,658	8,529	11,354	4,229	5,006	2,616	1,693	4,355
...	5,674	5,548	10,572	10,579	13,275	8,782	9,046	1,685	2,904	2,882	4,274	4,016
...	6,434	5,995	12,421	12,110	13,280	5,845	10,672	3,563	1,931	2,409	2,630	2,366
...	5,461	4,139	10,709	11,517	12,959	4,781	9,208	4,030	5,124	2,063	2,207	2,803
...	8,703	3,876	10,058	10,339	12,639	5,140	5,913	3,634	3,493	3,840	2,763	3,887
...	6,266	4,425	9,309	10,070	11,629	6,287	7,351	2,870	2,215	2,653	2,660	3,382
...	3,891	4,348	8,632	10,579	12,386	7,105	6,728	2,630	4,091	2,493	2,738	3,289
...	3,469	2,160	7,264	9,358	11,376	10,262	5,156	2,432	3,871	2,291	1,320	3,051
..	3,154	6,080	6,858	8,217	11,054	11,356	5,240	1,666	2,843	2,616	4,091	2,099
..	3,540	5,492	6,534	8,383	9,389	12,976	4,841	769	2,739	2,368	2,904	2,520
..	2,200	4,051	6,229	8,968	9,550	9,126	4,552	2,468	2,728	1,472	3,478	2,396
..	6,080	4,548	4,520	10,741	12,384	7,977	2,188	2,354	2,259	3,588	2,127	2,565
..	5,740	4,590	4,327	22,879	14,774	7,171	5,642	1,694	1,816	2,491	2,930	2,881
..	4,351	3,775	4,253	23,026	11,753	2,262	5,865	1,512	3,233	2,409	3,025	1,972
..	4,742	1,493	2,083	27,046	9,556	5,865	3,744	1,602	2,697	2,572	1,459	4,991
..	4,640	6,984	5,672	27,687	10,087	9,108	3,311	830	2,638	2,572	6,534	3,994
..	3,720	4,821	4,779	27,687	9,642	8,533	3,238	4,094	2,616	2,409	4,110	3,950
..	1,726	4,343	3,881	28,467	9,837	8,442	2,289	2,284	2,904	1,871	4,260	3,419
...	6,374	3,730	3,208	27,023	8,618	7,237	870	3,644	2,885	2,235	6,346	3,744
...	7,397	4,371	3,490	25,000	7,890	5,928	324	3,092	1,756	6,951	7,034	3,364
...	8,014	5,795	3,705	26,796	5,238	4,892	4,226	3,707	4,091	4,245	8,521	5,604
...	14,158	5,498	2,216	24,096	7,258	8,180	2,892	3,634	3,456	3,781	7,0.9	5,845
...	18,047	6,984	5,139	20,824	7,981	8,910	2,718	1,896	2,867	3,787	7,115	2,235
...	17,080	8,069	3,429	17,726	8,076	6,816	2,325	1,546	2,225	3,146	7,789	3,825
...	14,350	7,640	3,764	14,875	9,979	6,172	2,026	4,924	2,742	2,412	6,203	2,390
...	13,788	7,274	4,916	11,009	14,811	4,353	1,116	3,512	2,823	4,824	6,268	2,718
...	12,314	.....	9,163	11,523	14,342	3,818	4,187	3,405	1,823	6,555	7,464	2,906
...	12,197	.....	9,556	11,517	12,637	1,674	4,743	2,910	3,504	3,953	7,539	1,841
...	9,872	.....	9,746	.....	12,384	.....	3,515	3,519	.....	3,522	.....	4,343

Monthly discharge of Hudson River at Fort Edward, N. Y., for 1906.

[Drainage area, 2,800 square miles.]

Month.	Discharge in second-feet			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
y	18,000	1,730	7,580	2.71	3.12
ry	9,960	1,490	5,270	1.88	1.96
	12,400	2,080	6,210	2.22	2.56
	28,500	8,220	16,300	5.82	6.49
	14,800	5,240	11,100	3.96	4.56
	13,000	1,670	7,200	2.57	2.87
	13,100	324	5,040	1.80	2.08
	4,920	769	2,810	1.00	1.15
ber	5,120	1,760	2,970	1.06	1.18
r	6,950	1,470	3,130	1.12	1.29
ber	8,520	1,320	4,440	1.59	1.77
ber	5,900	1,840	3,440	1.23	1.42
he year	28,500	324	6,290	2.25	30.45

HUDSON RIVER AT MECHANICSVILLE, N. Y.

A record of the flow of Hudson River at Mechanicsville has be kept by the Duncan Company since December, 1888. The rec includes two daily readings of the depth on the crest of the dam an continuous record of the run of the water wheels in the adjoini paper mill. The accompanying tables, computed by Mr. R. P. Blo the engineer of the company, show the daily and monthly mean fl at Mechanicsville. The conditions at the station are described Water-Supply Paper No. 166, page 20, where are given also referen to publications that contain data for previous years.

Daily discharge, in second-feet, of Hudson River at Mechanicsville, N. Y., for 190

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	9,079	10,307	7,212	15,894	14,105	14,947	7,238	4,753	3,441	3,470	4,318
2	7,066	9,631	7,176	14,263	12,941	13,222	13,393	4,647	2,324	2,879	4,134
3	6,614	6,768	7,064	12,720	16,631	11,554	12,086	4,067	1,581	3,155	3,944
4	7,207	3,924	23,939	12,882	15,984	10,675	9,450	4,251	3,511	3,189	2,447
5	8,548	6,599	13,643	15,297	15,863	8,895	10,816	3,092	3,284	3,166	3,770
6	6,303	5,989	11,157	15,338	16,306	8,107	9,440	4,049	3,012	2,735	3,499
7	6,575	6,276	10,672	15,276	14,111	8,342	8,880	4,126	4,313	1,431	3,457
8	7,388	6,187	10,050	12,398	12,750	8,232	5,853	4,160	3,906	3,342	3,535
9	5,861	6,470	10,443	13,956	12,957	8,246	6,399	3,801	2,414	3,121	3,338
10	5,609	6,770	9,943	14,230	10,155	10,567	6,118	3,695	3,438	2,942	3,228
11	5,804	4,317	7,814	14,544	13,017	12,781	6,000	2,610	3,248	2,878	2,150
12	5,818	5,822	9,130	14,110	12,465	14,395	6,032	2,468	3,308	2,868	3,914
13	7,685	5,690	7,487	13,704	10,145	10,110	5,773	3,989	3,161	2,745	4,256
14	5,820	5,548	7,021	16,309	1[illegible],722	8,608	5,432	3,912	2,753	872	4,589
15	7,204	6,222	7,432	21,897	12,701	8,273	3,069	3,160	2,797	2,879	3,710
16	6,132	5,883	6,008	40,279	13,615	8,379	4,765	3,308	620	2,818	3,751
17	7,600	5,481	6,391	33,922	11,419	7,487	4,979	2,926	3,314	2,414	3,968
18	6,599	5,183	4,109	33,159	11,087	9,928	5,399	2,562	3,063	2,869	2,724
19	6,297	7,418	6,455	31,888	10,877	9,928	4,672	585	3,086	2,837	7,058
20	5,818	6,101	6,159	31,522	8,964	8,925	4,395	2,872	3,108	2,858	7,792
21	4,929	6,014	5,668	31,104	8,573	7,699	3,770	2,540	3,097	3,116	7,347
22	9,849	12,280	5,694	29,575	8,507	6,907	187	2,976	3,108	5,711	8,535
23	11,564	10,643	5,670	29,046	7,545	6,780	4,025	3,279	2,328	5,086	8,632
24	22,043	9,426	5,129	28,147	7,514	10,152	4,585	3,318	6,497	4,467	8,519
25	20,426	7,817	2,830	23,723	8,079	10,185	4,449	3,343	3,321	4,221	5,903
26	17,912	13,489	4,993	20,210	9,600	8,243	3,811	2,451	3,246	4,400	7,658
27	17,119	10,842	11,405	18,732	12,348	7,600	3,855	4,486	3,032	4,251	6,976
28	13,925	17,155	16,972	16,488	26,892	6,849	3,794	4,737	3,233	3,153	6,572
29	14,137	.....	15,979	12,718	27,833	6,369	1,738	4,410	3,166	5,371	7,149
30	10,972	.....	13,063	14,514	20,204	6,302	3,865	4,054	1,435	4,709	6,964
31	10,564	.....	14,364	.....	18,135	.....	4,927	3,333	.....	4,508	.....

Monthly discharge of Hudson River at Mechanicsville, N. Y., for 1906.

[Drainage area, 4,500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec. ft. per sq. mile.	Depth in
January	22,000	4,930	9,310	2.07	
February	17,200	3,920	7,650	1.70	
March	23,900	2,830	9,000	2.00	
April	40,300	12,400	20,600	4.58	
May	27,800	7,510	13,400	2.98	
June	14,900	6,300	9,290	2.06	
July	13,400	187	5,780	1.28	
August	4,750	585	3,480	.773	
September	6,500	620	3,070	.682	
October	5,710	872	3,370	.749	
November	8,630	2,150	5,130	1.14	
December	6,570	3,640	4,870	1.08	
The year	40,300	187	7,910	1.76	

INDIAN LAKE RESERVOIR AT INDIAN LAKE, NEW YORK.

A record of the stage of water in Indian Lake reservoir, located in e upper Hudson River basin, as described in preceding reports, has en continued. The conditions at the station are described in Water-pply Paper No. 166, page 24, where are given also references to blications that contain data for previous years.

Daily gage height, in feet, of Indian Lake reservoir, at Indian Lake, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	33.42	31.75	23.83	15.54	28.33	32.50	34.25	32.71	26.83	16.75	10.04	6.83
.....	33.50	31.58	23.54	15.33	28.83	32.42	34.50	32.58	26.58	16.42	9.83	6.67
.....	33.58	31.42	23.25	15.17	29.25	32.33	34.62	32.54	26.42	16.17	9.67	6.50
.....	33.67	31.25	23.00	15.17	29.67	32.25	34.62	32.50	26.25	15.92	9.50	6.75
.....	33.75	30.92	22.92	15.33	30.08	32.33	34.58	32.42	26.08	15.67	9.29	7.00
.....	33.79	30.75	22.58	15.58	30.38	32.42	34.62	32.33	25.92	15.42	9.08	7.08
.....	33.83	30.46	22.29	15.75	30.67	32.50	34.58	32.25	25.42	15.08	8.92	7.25
.....	33.88	30.17	22.00	15.92	30.92	32.67	34.58	32.13	25.00	14.75	8.75	7.50
.....	33.92	29.92	21.67	16.04	31.12	32.83	34.54	32.00	24.92	14.50	8.58	7.75
.....	33.71	29.62	21.33	16.17	31.33	32.92	34.50	31.92	24.17	14.25	8.42	7.92
.....	33.50	29.33	21.00	16.33	31.50	32.42	34.50	31.83	23.75	14.00	8.25	8.08
.....	33.29	29.00	20.67	16.50	31.75	32.50	34.46	31.71	23.33	13.75	8.13	8.17
.....	33.08	28.67	20.33	16.67	32.00	32.58	34.42	31.58	22.92	13.50	8.00	8.25
.....	32.92	28.33	20.00	16.92	32.25	32.62	34.42	31.42	22.58	13.25	7.83	8.33
.....	32.75	28.00	19.79	17.67	32.46	32.67	34.38	31.29	22.21	13.00	7.62	8.00
.....	32.58	27.71	19.42	18.67	32.67	32.75	34.33	31.21	21.83	12.75	7.50	7.75
.....	32.42	27.42	19.21	19.50	32.62	32.88	34.29	31.13	21.50	12.50	7.38	7.58
.....	32.17	27.08	19.00	20.50	32.58	33.00	34.25	31.00	21.08	12.25	7.25	7.42
.....	32.00	26.83	18.67	21.50	32.50	33.08	34.21	30.83	20.67	12.00	7.25	7.25
.....	31.83	26.58	18.33	22.58	32.38	33.17	34.17	30.58	20.33	12.00	7.25	7.00
.....	31.75	26.33	18.00	23.58	32.25	33.21	34.13	30.29	20.00	11.88	7.21	6.83
.....	31.67	26.08	17.79	24.58	32.17	33.33	33.92	29.92	19.62	11.67	7.25	6.67
.....	31.75	25.67	17.42	25.50	32.08	33.42	33.83	29.58	19.25	11.50	7.25	6.50
.....	32.08	25.42	17.25	25.96	32.08	33.50	33.67	29.17	18.92	11.25	7.29	6.33
.....	32.33	25.08	17.00	26.42	32.17	33.58	33.42	28.83	18.58	11.21	7.25	6.17
.....	32.42	24.75	16.75	26.83	32.33	33.62	33.29	28.50	18.25	11.08	7.21	6.00
.....	32.42	24.42	16.58	27.17	32.54	33.67	33.17	28.25	17.92	10.96	7.17	5.83
.....	32.33	24.08	16.33	27.42	32.67	33.75	33.08	28.00	17.58	10.88	7.08	5.67
.....	32.21	.....	16.08	27.67	32.75	33.83	33.00	27.67	17.25	10.67	7.00	5.50
.....	32.08	.....	15.92	28.00	32.67	33.92	32.92	27.33	17.00	10.54	6.92	5.33
.....	31.96	.....	15.75	.....	32.58	.....	32.83	27.08	.....	10.25	.....	5.29

OTE.—The reservoir gates were open during the greater portion of the year, the closed period ng as follows: January 1 to 7, April 5 to May 11, July 4 to 18, December 5 to 13.

HOOSIC RIVER AT BUSKIRK, N. Y.

This station was established September 25, 1903, at the highway idge in Buskirk village. The conditions and the bench marks are scribed in Water-Supply Paper No. 166, page 25, where are given so references to publications that contain data for previous years.

Discharge measurements of Hoosic River at Buskirk, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec. ft.*
bruary 10[a]..	Covert & Weeks	130	576	3.90	709
gust 3	C. C. Covert	126	377	1.90	336
gust 22	do	126	377	1.86	328
tober 10	do	115	328	1.50	171

River frozen over, average thickness of ice 0.54 foot; considerable needle ice. Gage height to tom of ice, 3.26 feet.

Daily gage height, in feet, of Hoosic River at Buskirk, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.52	2.68	2.60	3.55	2.95	3.52	2.42	2.50	1.60	1.55	1.65
2	2.50	2.68	2.70	3.32	3.32	3.15	2.35	2.12	1.55	1.55	1.80
3	2.55	3.75	2.65	3.25	4.20	3.10	2.95	2.08	1.48	1.60	1.72
4	2.62	3.52	8.05	3.30	3.50	2.90	2.80	2.02	1.85	1.50	1.65
5	2.82	4.00	4.15	4.25	3.05	2.65	2.75	2.10	1.75	1.55	1.75
6	2.80	3.58	3.25	4.28	3.15	2.92	2.55	2.05	1.68	1.48	1.88
7	2.52	3.80	3.05	3.85	3.15	2.58	2.42	2.02	1.65	1.30	1.68
8	2.68	3.68	2.55	3.38	2.95	3.10	2.20	2.02	1.65	1.38	1.80
9	2.40	3.70	2.92	3.80	3.25	3.22	2.28	1.85	1.40	1.35	1.70
10	2.50	3.70	2.65	3.88	4.05	4.05	2.25	1.90	1.55	1.80	1.65
11	4.22	3.52	2.45	4.45	3.42	4.25	2.22	1.98	1.52	1.90	1.72
12	3.95	3.65	2.50	4.35	3.20	3.40	2.08	2.10	1.52	1.92	2.50
13	3.42	3.65	2.30	4.25	3.02	2.90	2.10	2.05	1.55	1.82	2.25
14	2.82	3.68	2.45	4.48	3.45	2.72	1.98	1.90	1.62	1.68	2.20
15	2.65	3.68	2.35	8.90	3.02	2.65	1.78	1.80	1.62	1.72	1.88
16	2.48	3.55	2.40	9.35	2.90	2.52	1.78	1.65	1.48	1.68	1.90
17	2.88	3.60	2.35	6.10	2.78	2.62	1.95	1.65	1.38	1.60	1.85
18	2.60	3.32	2.10	5.38	2.72	2.82	2.85	1.50	1.30	1.60	1.82
19	2.55	3.52	2.30	5.08	2.58	2.58	2.30	1.40	1.40	1.60	4.30
20	2.32	3.60	2.28	4.90	2.58	2.50	2.15	1.52	1.28	2.52	3.42
21	3.02	3.85	2.25	4.48	2.48	2.50	2.00	1.70	1.40	3.05	3.15
22	3.70	6.85	2.22	4.28	2.35	2.32	2.02	1.80	1.55	2.48	3.35
23	5.38	3.95	2.20	4.05	2.28	2.40	2.10	1.82	1.85	2.22	3.28
24	6.50	3.40	2.25	3.80	2.30	4.30	2.40	1.75	1.98	2.12	3.15
25	4.15	3.25	2.00	3.70	2.35	3.18	2.18	1.62	1.75	2.00	2.70
26	3.58	4.85	2.35	3.40	2.52	2.55	1.90	1.52	1.62	2.28	2.60
27	3.32	3.45	6.60	3.25	4.40	2.45	1.92	1.60	1.70	2.10	2.50
28	3.05	2.65	5.55	3.15	8.59	2.30	1.82	2.02	1.65	2.02	2.52
29	2.92	.....	3.90	2.95	6.55	2.32	1.80	1.82	1.65	2.22	2.40
30	2.82	.....	3.60	2.95	4.82	2.40	2.00	1.75	1.48	1.95	2.40
31	2.78	.....	3.80	.....	4.10	.....	2.50	1.65	.....	2.08	.....

NOTE.—Ice conditions January 10–13: River frozen over solid at bridge February 1 to 22; ice 0.3 to 0.75 foot thick. Ice went out of river during night of February 22. No ice in river d March except anchor ice. Anchor ice January 1, 2, 7, and 26, February 10 and 11, March 15, 16, a Ice conditions in December: Anchor ice running from December 3 to 8. December 9 gage h was to ice surface; December 17 the river was frozen over solid, and records were discont Ice went out of river December 31.

During the frozen period of January and February readings were taken to water surface th hole cut in ice; for December readings were to top of ice.

Rating table for Hoosic River at Buskirk, N. Y., for 1903–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	74	2.40	642	3.60	1,614	5.60	4,040
1.30	106	2.50	704	3.70	1,716	5.80	4,320
1.40	140	2.60	769	3.80	1,822	6.00	4,600
1.50	176	2.70	837	3.90	1,930	6.20	4,890
1.60	216	2.80	909	4.00	2,040	6.40	5,180
1.70	260	2.90	985	4.20	2,265	6.60	5,480
1.80	308	3.00	1,065	4.40	2,495	6.80	5,780
1.90	359	3.10	1,149	4.60	2,735	7.00	6,080
2.00	412	3.20	1,236	4.80	2,985	8.00	7,620
2.10	467	3.30	1,326	5.00	3,240	9.00	9,220
2.20	524	3.40	1,419	5.20	3,500	10.00	10,880
2.30	582	3.50	1,515	5.40	3,770		

NOTE.—The above table is applicable only for open-channel conditions. It is based on dis measurements made during 1903–1906, and is fairly well defined between gage heights 1.6 fe 7.0 feet.

Monthly discharge of Hoosic River at Buskirk, N. Y., for 1906.

[Drainage area, 579 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary[a]	5,330	.....	1,150	1.99	2.29
uary[b]	.....	.....	1,030	1.78	1.85
ch	7,710	412	1,330	2.30	2.65
l	9,810	1,020	2,580	4.46	4.98
	8,570	570	1,610	2.78	3.20
	2,380	582	1,030	1.78	1.99
	1,020	298	545	.941	1.08
ust	704	140	339	.585	.67
ember	401	100	214	.370	.41
ber	1,110	106	357	.617	.71
ember	2,386	74	600	1.04	1.16
ember[c]	.....	.....	.....	.....	.....

ce conditions January 10 to 13; discharge estimated 600 second-feet. Assumed that anchor ice not materially affect the flow.
ce conditions February 1 to 22; discharge estimated 700 second-feet February 1 to 21, and 4,000 nd-feet February 22 on the assumption that there was more or less back water due to ice conditions.
A comparison of the flow at this station from December 1 to 22 with that of the Mohawk River at sbach Ferry Bridge indicates that the mean flow for December was less than 750 second-feet.
OTE.—Values are rated as follows: January, good; February, fair; March to November, excellent.

MOHAWK RIVER AT LITTLE FALLS, N. Y.

This station is located at the lower (Gilbert's) dam at Little Falls, Y. The conditions are described in Water Supply Paper No. 166, ge 28, where are given also references to publications that contain ta for previous years.

Daily discharge, in second-feet, of Mohawk River at Little Falls, N. Y., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	July.	Day.	Jan.	Feb.	Mar.	Apr.	May.	July.
....	3,560	2,590	1,820	6,410	2,160	574	17	2,690	1,060	1,140	10,730	1,770	903
....	3,470	1,590	1,660	4,830	1,810	1,120	18	2,240	1,140	1,130	8,790	1.570	1,040
....	2,080	839	1,520	3,130	5,910	3,560	19	2,290	1,210	921	6,880	1,400	810
....	1,990	1,210	5,810	3,580	5,820	4,960	20	1,960	1,210	914	6,520	842	704
....	3,790	1,270	5,000	5,450	4,270	3,570	21	3,030	2,910	1,020	6,950	796	600
....	3,820	1,110	5,000	5,380	3,860	2,620	22	6,780	5,240	1,140	7,620	649	496
....	2,610	1,100	3,590	4,300	2,320	1,500	23	10,690	1,980	921	7,140	684	741
....	2,080	1,100	2,610	3,240	1,710	725	24	16,700	5,190	1,020	4,740	766	701
....	1,480	1,180	2,420	2,630	2,090	1,760	25	14,200	4,930	958	3,210	684	626
....	1,480	1,190	2,730	3,020	2,040	2,820	26	8,450	5,400	1,100	2,400	734	653
....	1,620	1,210	2,180	5,020	1,980	3,400	27	5,920	5,290	5,960	3,120	3,290	549
....	2,080	1,070	1,780	5,950	1,460	2,150	28	4,260	3,400	11,010	2,540	4,920	587
....	2,270	1,140	1,590	5,380	1,480	1,090	29	2,770	.....	10,900	3,220	3,510	427
....	2,230	1,220	1,350	5,420	4,590	726	30	2,130	.....	7,950	2,410	2,030	729
....	2,080	1,180	1,150	12,100	3,700	725	31	2,530	.....	7,620	.....	1,170	1,270
....	2,070	1,220	1,030	12,020	1,980	905							

OTE.—January 24 and 25, discharge approximate.

Monthly discharge of Mohawk River at Little Falls, N. Y., for 1906.

[Drainage area, 1,310 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	16,700	1,480	4,040	3.08	[illegible]
February	5,400	839	2,220	1.70	1.77
March	11,000	914	3,060	2.34	[illegible]
April	12,100	2,400	5,470	4.18	[illegible]
May	5,910	649	2,320	1.77	[illegible]
July	4,960	427	1,390	1.06	[illegible]

MOHAWK RIVER AT DUNSBACH FERRY BRIDGE, NEW YORK.

This station was established March 12, 1898, for the primary purpose of checking a system of levels for the United States Board of Engineers on Deep Waterways, by D. J. Howell, civil engineer, who has furnished the earlier portion of the record. The station is located at the dam of the West Troy Water Company, one-fifth mile above Dunsbach Ferry Bridge, 9 miles from the mouth of the river. The conditions at the station are described in Water Supply Paper No. 166, page 29, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Mohawk River at Dunsbach Ferry Bridge, New York, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7,181	4,757	4,841	20,351	5,440	5,921	4,191	1,871	1,641	1,411	3,101	[illegible]
2	5,617	3,591	4,191	14,691	5,660	5,061	8,721	1,871	1,411	1,411	2,931	6,171
3	3,897	2,931	3,981	11,861	11,374	4,191	7,941	1,871	1,411	1,641	2,761	[illegible]
4	3,507	2,271	30,723	10,681	14,430	3,591	5,701	1,761	1,301	1,411	2,761	[illegible]
5	5,407	2,601	19,779	14,691	11,507	3,261	5,061	1,641	1,181	1,301	2,601	[illegible]
6	7,857	2,101	13,160	15,031	9,841	3,261	4,841	1,761	951	1,181	2,431	[illegible]
7	7,097	2,271	10,804	16,401	8,721	3,761	3,981	2,761	1,066	1,181	2,101	[illegible]
8	4,977	2,761	7,845	11,861	6,681	3,261	3,261	2,431	1,181	1,521	1,981	[illegible]
9	2,847	2,761	6,931	9,561	5,701	3,101	2,761	2,271	1,066	1,641	1,871	[illegible]
10	2,347	2,761	6,681	9,281	5,701	3,261	2,601	1,981	951	1,787	1,981	[illegible]
11	2,677	2,601	6,171	15,711	6,421	4,977	3,761	1,871	841	1,787	2,101	[illegible]
12	3,347	2,761	5,491	22,041	5,921	5,617	5,271	1,521	841	2,017	2,431	[illegible]
13	4,537	2,761	4,411	21,309	5,271	5,187	3,981	1,411	841	2,517	3,261	[illegible]
14	5,187	2,601	3,761	18,131	5,061	3,794	3,261	1,411	841	2,347	3,431	[illegible]
15	4,537	2,761	3,431	21,621	7,681	3,196	3,101	1,181	841	2,187	3,761	[illegible]
16	4,537	2,761	3,160	36,541	6,681	4,841	2,761	1,181	841	1,897	3,591	[illegible]
17	4,757	2,431	3,261	26,661	5,271	6,681	2,761	1,181	786	1,787	3,101	[illegible]
18	4,537	2,431	3,101	22,251	4,621	9,561	2,271	1,181	731	1,787	2,931	[illegible]
19	4,327	2,431	3,101	18,871	4,191	8,721	2,101	1,066	730	1,871	6,171	[illegible]
20	3,897	2,761	2,761	17,081	3,761	7,681	1,981	951	730	2,101	17,421	[illegible]
21	4,107	3,101	2,601	16,061	3,261	5,701	1,871	1,066	730	3,761	13,421	[illegible]
22	7,597	6,931	2,271	15,371	3,101	3,981	1,871	1,181	896	6,681	12,801	[illegible]
23	19,897	17,761	2,101	15,031	2,761	3,591	1,871	1,181	1,301	5,271	10,961	[illegible]
24	29,937	12,801	2,389	13,121	2,601	3,431	1,641	1,521	1,521	3,261	8,721	[illegible]
25	25,327	11,861	2,347	10,681	2,431	3,101	1,641	1,521	1,761	2,761	7,181	[illegible]
26	16,997	14,041	2,347	8,721	2,431	3,101	1,641	1,521	1,761	2,931	5,921	[illegible]
27	12,717	10,961	3,431	7,681	2,761	2,761	1,411	1,761	1,641	3,101	6,171	[illegible]
28	9,197	6,931	47,850	6,931	21,461	2,761	1,411	1,981	1,411	3,101	6,421	[illegible]
29	7,097	.....	24,360	6,421	18,131	2,601	1,641	2,101	1,521	3,101	6,931	[illegible]
30	4,977	.....	21,777	5,921	12,171	2,271	1,641	1,871	1,521	3,261	7,431	[illegible]
31	4,977	.....	25,737	.....	7,681	.....	1,871	1,761	.....	3,431	.....	[illegible]

Monthly discharge of Mohawk River at Dunsbach Ferry, New York, for 1906.

[Drainage area, 3,440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ary	29,900	2,350	7,610	2.21	2.55
uary	17,800	2,100	4,980	1.45	1.51
h	47,800	2,100	9,200	2.67	3.08
l	36,500	5,920	15,500	4.51	5.03
	21,500	2,430	7,060	2.05	2.36
	9,560	2,270	4,410	1.28	1.43
	8,720	1,410	3,190	.927	1.07
ust	2,760	951	1,630	.474	.55
ember	1,760	730	1,140	.331	.37
ber	6,680	1,180	2,430	.706	.81
ember	17,400	1,870	5,290	1.54	1.72
mber	9,000	2,600	4,270	1.24	1.43
Total	47,800	730	5,560	1.62	21.91

TE.—Values for this station are in general considered as good, although occasionally during the er months the flow is obstructed by ice, causing temporary errors greater than 10 per cent.

ORISKANY CREEK, AT COLEMAN, N.Y.

A station was established, June 5, 1901, at Wood Road Bridge, 1 le above the village of Oriskany, and was discontinued November 1904, a new station having been established at Coleman, 1 mile stream, where a cableway was erected for use in making current-ter measurements during high water. Observations at the cable tion were begun August 13, 1904, and discontinued April 30, 1906. e conditions at the latter station and the bench marks are described Water-Supply Paper No. 166, page 31, where are given also refer-es to publications that contain data for previous years.

The following discharge measurement was made September 17, 1906:

Width, 75 feet; area, 79 square feet; gage height, 0.49 foot; discharge, 110 second-

Daily gage height, in feet, of Oriskany Creek, at Coleman, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
	1.78	1.60	1.30	2.05	1.02	17	1.70	1.32	0.82	1.48	
	1.78	1.32	1.30	1.88	1.05	18	1.72	1.52	1.22	1.35	
	1.70	1.28	1.10	1.62		19	1.75	1.48	0.92	1.60	
	2.25	1.20	2.95	1.80		20	1.52	1.15	1.20	1.52	
	2.10	1.35	1.78	2.75							
						21	3.05	3.55	1.18	1.48	
	1.95	1.25	1.32	2.35		22	3.15	2.15	1.08	1.55	
	1.58	1.48	1.48	2.00		23	2.85	2.02	1.40	1.42	
	1.90	1.45	1.32	1.85		24	3.45	1.75	1.15	1.38	
	1.78	1.50	1.32	1.95		25	2.15	1.82	1.10	1.25	
	1.95	1.32	1.22	2.65							
						26	1.45	2.05	1.20	1.18	
	2.70	1.10	1.22	2.65		27	1.45	1.50	3.30	1.20	
	2.00	1.58	1.20	2.35		28	1.65	1.05	2.50	1.15	
	1.90	1.50	1.15	2.02		29	1.48		2.10	1.12	
	1.65	1.40	1.12	1.92		30	1.70		2.35	1.20	
	1.65	1.38	1.05	2.80		31	1.70		2.95		
	1.50	1.20	1.22	2.10							

TE.—Ice conditions from January 1 to March 20 approximately; thickness varied from 0.1 foot foot; creek frozen over most of the time.

onthly discharge of Mohawk River at Dunsbach Ferry, New York, for 1906.

[Drainage area, 3,440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	29,900	2,350	7,610	2.21	2.55
.....	17,800	2,100	4,980	1.45	1.51
.....	47,800	2,100	9,200	2.67	3.08
.....	36,500	5,920	15,500	4.51	5.03
.....	21,500	2,430	7,060	2.05	2.36
.....	9,560	2,270	4,410	1.28	1.43
.....	8,720	1,410	3,190	.927	1.07
.....	2,760	951	1,630	.474	.55
er.....	1,760	730	1,140	.331	.37
.....	6,680	1,180	2,430	.706	.81
er.....	17,400	1,870	5,290	1.54	1.72
r.....	9,000	2,600	4,270	1.24	1.43
tal.....	47,800	730	5,560	1.62	21.91

—Values for this station are in general considered as good, although occasionally during the ionths the flow is obstructed by ice, causing temporary errors greater than 10 per cent.

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llowing discharge measurement was made September 17, 1906:

75 feet; area, 79 square feet; gage height, 0.49 foot; discharge, 110 second-

Daily gage height, in feet, of Oriskany Creek, at Coleman, N. Y., for 1906.

r.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
.....	1.78	1.60	1.30	2.05	1.02	17.....	1.70	1.32	0.82	1.48	.....
.....	1.78	1.32	1.30	1.88	1.05	18.....	1.72	1.52	1.22	1.35	.....
.....	1.70	1.28	1.10	1.62	.....	19.....	1.75	1.48	0.92	1.60	.....
.....	2.25	1.20	2.95	1.80	.....	20.....	1.52	1.15	1.20	1.52	.....
.....	2.10	1.35	1.78	2.75	.....						
						21.....	3.05	3.55	1.18	1.48	.....
.....	1.95	1.25	1.32	2.35	.....	22.....	3.15	2.15	1.08	1.55	.....
.....	1.58	1.48	1.48	2.00	.....	23.....	2.85	2.02	1.40	1.42	.....
.....	1.90	1.45	1.32	1.85	.....	24.....	3.45	1.75	1.15	1.38	.....
.....	1.78	1.50	1.32	1.95	.....	25.....	2.15	1.82	1.10	1.25	.....
.....	1.95	1.32	1.22	2.65	.....						
						26.....	1.45	2.05	1.20	1.18	.....
.....	2.70	1.10	1.22	2.65	.....	27.....	1.45	1.50	3.30	1.20	.....
.....	2.00	1.58	1.20	2.35	.....	28.....	1.65	1.05	2.50	1.15	.....
.....	1.90	1.50	1.15	2.02	.....	29.....	1.48	.....	2.10	1.12	.....
.....	1.65	1.40	1.12	1.92	.....	30.....	1.70	.....	2.35	1.20	.....
.....	1.65	1.38	1.05	2.80	.....	31.....	1.70	.....	2.95	.....	.....
.....	1.50	1.20	1.22	2.10	.....						

Ice conditions from January 1 to March 20 approximately; thickness varied from 0.5 foot. Creek frozen over most of the time.

Monthly discharge of Mohawk River at Little Falls, N. Y., for 1906.

[Drainage area, 1,310 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	16,700	1,480	4,040	3.08	3.55
February	5,400	839	2,220	1.70	1.77
March	11,000	914	3,060	2.34	2.70
April	12,100	2,400	5,470	4.18	4.66
May	5,910	649	2,320	1.77	2.04
July	4,960	427	1,390	1.06	1.22

MOHAWK RIVER AT DUNSBACH FERRY BRIDGE, NEW YORK.

This station was established March 12, 1898, for the primary purpose of checking a system of levels for the United States Board of Engineers on Deep Waterways, by D. J. Howell, civil engineer, who has furnished the earlier portion of the record. The station is located at the dam of the West Troy Water Company, one-fifth mile above Dunsbach Ferry Bridge, 9 miles from the mouth of the river. The conditions at the station are described in Water Supply Paper No. 166, page 29, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Mohawk River at Dunsbach Ferry Bridge, New York, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7,181	4,757	4,841	20,351	5,440	5,921	4,191	1,871	1,641	1,411	3,101	6,681
2	5,617	3,591	4,191	14,691	5,660	5,061	8,721	1,871	1,411	1,411	2,931	6,171
3	3,897	2,931	3,981	11,861	11,374	4,191	7,941	1,871	1,411	1,641	2,761	5,701
4	3,507	2,271	30,723	10,681	14,430	3,591	5,701	1,761	1,301	1,411	2,761	3,261
5	5,407	2,601	19,779	14,691	11,507	3,261	5,061	1,641	1,181	1,301	2,601	2,601
6	7,857	2,101	13,160	15,031	9,841	3,261	4,841	1,761	951	1,181	2,431	2,601
7	7,097	2,271	10,804	16,401	8,721	3,761	3,981	2,761	1,066	1,181	2,101	3,761
8	4,977	2,761	7,845	11,861	6,681	3,261	3,261	2,431	1,181	1,521	1,981	4,621
9	2,847	2,761	6,931	9,561	5,701	3,101	2,761	2,271	1,066	1,641	1,871	4,191
10	2,347	2,761	6,681	9,281	5,701	3,261	2,601	1,981	951	1,787	1,981	3,431
11	2,677	2,601	6,171	15,711	6,421	4,977	3,761	1,871	841	1,787	2,101	3,101
12	3,347	2,761	5,491	22,041	5,921	5,617	5,271	1,521	841	2,017	2,431	3,101
13	4,537	2,761	4,411	21,309	5,271	5,187	3,981	1,411	841	2,517	3,261	3,431
14	5,187	2,601	3,761	18,131	5,061	3,794	3,261	1,411	841	2,347	3,431	3,101
15	4,537	2,761	3,431	24,621	7,681	3,196	3,101	1,181	841	2,187	3,761	2,931
16	4,537	2,761	3,460	36,541	6,681	4,841	2,761	1,181	841	1,897	3,591	3,761
17	4,757	2,431	3,261	26,661	5,271	6,681	2,761	1,181	786	1,787	3,101	9,001
18	4,537	2,431	3,101	22,251	4,621	9,561	2,271	1,181	731	1,787	2,931	8,721
19	4,327	2,431	3,101	18,871	4,191	8,721	2,101	1,066	730	1,871	6,171	7,431
20	3,897	2,761	2,761	17,081	3,761	7,681	1,981	951	730	2,101	17,421	6,421
21	4,107	3,101	2,601	16,061	3,261	5,701	1,871	1,066	730	3,761	13,421	5,271
22	7,597	6,931	2,271	15,371	3,101	3,981	1,871	1,181	896	6,681	12,801	3,761
23	19,897	17,761	2,101	15,031	2,761	3,591	1,871	1,181	1,301	5,271	10,961	3,761
24	29,937	12,801	2,389	13,421	2,601	3,431	1,641	1,521	1,521	3,261	8,721	3,761
25	25,327	11,861	2,347	10,681	2,431	3,101	1,641	1,521	1,761	2,761	7,181	3,431
26	16,997	14,041	2,347	8,721	2,431	3,101	1,641	1,521	1,761	2,931	5,921	3,261
27	12,717	10,961	3,431	7,681	2,761	2,761	1,411	1,761	1,641	3,101	6,171	2,931
28	9,197	6,931	47,850	6,931	21,461	2,761	1,411	1,981	1,411	3,101	6,421	2,761
29	7,097	.....	24,360	6,421	18,131	2,601	1,641	2,101	1,521	3,101	6,931	2,761
30	4,977	.....	21,777	5,921	12,171	2,271	1,641	1,871	1,521	3,261	7,431	2,931
31	4,977	.....	25,737	.....	7,681	.....	1,871	1,761	.....	3,431	.....	3,591

Monthly discharge of Mohawk River at Dunsbach Ferry, New York, for 1906.

[Drainage area, 3,440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary	29,900	2,350	7,610	2.21	2.55
ruary	17,800	2,100	4,980	1.45	1.51
rch	47,800	2,100	9,200	2.67	3.08
il	36,500	5,920	15,500	4.51	5.03
y	21,500	2,430	7,060	2.05	2.36
e	9,560	2,270	4,410	1.28	1.43
y	8,720	1,410	3,190	.927	1.07
ust	2,760	951	1,630	.474	.55
tember	1,760	730	1,140	.331	.37
ober	6,680	1,180	2,430	.706	.81
vember	17,400	1,870	5,290	1.54	1.72
ember	9,000	2,600	4,270	1.24	1.43
Total	47,800	730	5,560	1.62	21.91

OTE.—Values for this station are in general considered as good, although occasionally during the ter months the flow is obstructed by ice, causing temporary errors greater than 10 per cent.

ORISKANY CREEK, AT COLEMAN, N.Y.

A station was established, June 5, 1901, at Wood Road Bridge, 1 le above the village of Oriskany, and was discontinued November , 1904, a new station having been established at Coleman, 1 mile stream, where a cableway was erected for use in making current-ter measurements during high water. Observations at the cable tion were begun August 13, 1904, and discontinued April 30, 1906. e conditions at the latter station and the bench marks are described Water-Supply Paper No. 166, page 31, where are given also refer-es to publications that contain data for previous years.

The following discharge measurement was made September 17, 1906:

Width, 75 feet; area, 79 square feet; gage height, 0.49 foot; discharge, 110 second-.

Daily gage height, in feet, of Oriskany Creek, at Coleman, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	Day.	Jan.	Feb.	Mar.	Apr.	May.
	1.78	1.60	1.30	2.05	1.02	17	1.70	1.32	0.82	1.18	.....
	1.78	1.32	1.30	1.88	1.05	18	1.72	1.52	1.22	1.35	.....
	1.70	1.28	1.10	1.62	.....	19	1.75	1.48	0.92	1.60	.....
	2.25	1.20	2.95	1.80	.....	20	1.52	1.15	1.20	1.52	.....
	2.10	1.35	1.78	2.75	.....						
						21	3.05	3.55	1.18	1.18	.....
	1.95	1.25	1.32	2.35	.....	22	3.15	2.15	1.08	1.55	.....
	1.58	1.48	1.48	2.00	.....	23	2.85	2.02	1.40	1.42	.....
	1.90	1.45	1.32	1.85	.....	24	3.45	1.75	1.15	1.38	.....
	1.78	1.50	1.32	1.95	.....	25	2.15	1.82	1.10	1.25	.....
	1.95	1.32	1.22	2.65	.....						
						26	1.45	2.05	1.20	1.18	.....
	2.70	1.10	1.22	2.65	.....	27	1.45	1.50	3.30	1.20	.....
	2.00	1.58	1.20	2.35	.....	28	1.65	1.05	2.50	1.15	.....
	1.90	1.50	1.15	2.02	.....	29	1.48	.....	2.10	1.12	.....
	1.65	1.40	1.12	1.92	.....	30	1.70	.....	2.35	1.20	.....
	1.65	1.38	1.05	2.80	.....	31	1.70	.....	2.95	.....	.....
	1.50	1.20	1.22	2.10	.....						

OTE.—Ice conditions from January 1 to March 20 approximately; thickness varied from 0.1 foot l foot; creek frozen over most of the time.

STARCH FACTORY CREEK NEAR NEW HARTFORD, N. Y.

A gaging weir was erected on this creek above the head of t former Savage reservoir May 26, 1903. The conditions at the stati are described in Water-Supply Paper No. 166, page 33, where a given also references to publications that contain data for previo years.

Daily discharge, in second-feet, of Starch Factory Creek, near New Hartford,[a] N. Y., 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1	3.27	1.41	0.97	5.00	1.41	1.29	2.34	0.47	0.39	1.01	1.53	5
2	2.65	.97	.97	4.45	4.82	1.29	1.41	.39	.31	.91	1.35	2
3	2.34	.86	1.29	5.57	31.0	1.29	1.06	.47	.39	.64	1.17	2
4	3.76	.97	4.28	13.95	5.38	1.06	2.34	.47	.39	.43	1.06	1
5	5.38	1.06	2.06	16.56	12.43	.86	1.29	.47	.31	3.76	.97	1
6	3.59	.97	5.19	11.47	4.28	.86	.86	.47	.31	1.92	.97	5
7	2.95	.97	2.50	6.75	3.59	.86	.75	.47	.31	4.64	.86	5
8	2.34	.97	2.06	6.97	2.65	2.34	.64	.47	.31	1.41	.75	2
9	2.20	1.06	2.50	4.64	2.65	2.06	2.80	.39	.31	1.35	.75	1
10	2.06	.97	2.06	18.76	2.50	3.43	2.34	.39	.31	1.23	1.29	1
11	1.92	.97	1.29	34.2	1.78	1.78	2.06	.39	.31	1.71	1.53	1
12	2.34	.97	1.29	31.8	1.53	1.17	1.06	.39	.31	1.59	1.99	1
13	2.20	1.06	1.29	27.8	3.93	.86	.86	.39	.31	1.23	1.92	1
14	1.78	1.29	1.29	32.5	4.82	.86	.75	.39	.39	1.01	2.06	1
15	2.20	1.17	1.06	46.0	2.50	.75	.64	.39	.31	.86	1.78	13
16	3.93	1.06	.97	13.95	1.78	3.59	.64	.31	.31	.75	1.85	7
17	2.95	1.06	.97	7.61	1.53	3.27	.86	.31	.31	.75	2.20	3
18	2.95	1.17	1.06	5.00	2.06	1.78	.75	.31	.31	.75	[b]133.00	2
19	2.65	1.17	1.06	4.28	1.53	1.41	.75	.31	.31	.75	12.19	1
20	2.65	1.41	1.06	3.27	1.29	1.06	.64	.64	.31	10.40	7.19	1
21	83.40	55.8	1.06	2.95	1.06	1.06	.56	.64	.47	3.10	13.19	1
22	51.00	8.69	1.06	5.00	.86	.86	.47	.47	.47	1.85	7.82	1
23	70.70	4.28	.86	3.10	.86	.86	.39	.39	.86	1.47	5.38	1
24	17.20	6.97	.86	2.65	.75	.86	.39	.39	.64	1.23	4.45	1
25	4.28	8.25	.97	2.50	.86	.75	.39	.39	.47	4.64	3.27	1
26	2.65	4.64	4.64	2.06	.75	.75	.39	.31	.39	1.99	3.35	1
27	2.20	2.06	150.6	1.78	53.3	.64	.39	2.65	.47	1.47	4.45	1
28	1.78	1.41	18.45	1.53	6.15	.56	.39	.64	.39	1.99	6.05	1
29	1.06	.....	17.37	1.41	3.93	.86	.39	.47	.39	1.85	3.67	1
30	1.06	.....	31.7	2.06	2.95	1.41	.47	.39	1.29	1.48	3.51	2
31	1.78	.....	17.0	.....	1.65	.....	.47	.39	.....	1.53	.....	5

[a] Daily discharge does not include diversion from drainage basin of Graefenberg Creek.
[b] Approximate.

Monthly discharge of Starch Factory Creek near New Hartford, N. Y., for 1906.

[Drainage area, 3.4 square miles.]

Month.	Discharge in second-feet.			Corrected mean.[a]	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth inch
January	83.4	1.06	9.46	10.23	3.01	3
February	55.8	.86	4.06	4.83	1.42	1
March	150.6	.86	8.86	9.63	2.83	3
April	46.0	1.41	10.85	11.62	3.42	3
May	53.3	.75	5.37	6.14	1.80	2
June	3.59	.56	1.35	2.12	.623	
July	2.80	.39	.95	1.72	.506	
August	2.65	.31	.50	1.27	.374	
September	1.29	.31	.41	.48	.141	
October	10.40	.43	1.93	2.60	.765	
November	133.00	.75	7.72	8.49	2.50	2
December	54.70	1.06	4.38	5.15	1.51	1
The year	150.6	.31	4.65	5.36	1.58	21

[a] Includes diversion from Graefenberg Creek.

SYLVAN GLEN CREEK NEAR NEW HARTFORD, N. Y.

The weir now used, which is located at the mouth of the stream, was erected in January, 1904, by the Consolidated Water Company, of Utica, N. Y., by whom the record is furnished. The conditions at the station and the bench marks are described in Water-Supply Paper No. 166, page 36, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Sylvan Glen Creek near New Hartford, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.06	0.86	0.21	3.13	0.31	0.31	0.38	0.04	0.04	0.46	0.71	1.34
2	.76	.56	.15	2.42	3.34	.24	.15	.04	.04	.27	.41	.86
3	.66	.34	.24	3.13	7.74	.18	.10	.10	.04	.12	.38	.71
4	1.16	.27	2.75	6.26	2.75	.15	.27	.10	.04	0	.32	.61
5	1.42	.24	.96	4.59	6.75	.15	.15	.08	.04	1.26	.31	.56
6	.96	.18	.76	4.80	2.09	.15	.05	.10	.02	.56	.29	2.67
7	.76	.18	.66	3.54	1.06	.18	.05	.05	0	1.92	.22	2.34
8	.66	.18	.56	2.59	.86	2.42	.05	.05	0	.31	.20	.81
9	.66	.21	.76	1.92	.86	.42	7.25	.04	0	.42	.16	.61
10	.46	.21	.56	10.20	.66	11.08	1.16	.04	0	.46	.29	.51
11	.42	.18	.42	9.32	.42	.56	.76	.06	0	.42	.61	.51
12	.76	.21	.38	6.26	.42	.31	.34	.04	0	.34	1.42	.40
13	.76	.21	.34	4.38	2.26	.18	.15	.04	0	.21	1.11	.34
14	.56	.21	.27	4.17	1.59	.12	.15	.04	0	.15	.91	.34
15	.56	.21	.24	9.32	.76	.10	.10	.04	0	.10	.86	6.75
16	1.42	.18	.24	2.59	.42	.42	.10	.04	0	.10	.86	3.44
17	1.16	.21	.18	1.92	.34	.46	.15	.04	0	.10	.81	1.82
18	1.16	.21	.18	1.26	.56	.42	.12	.02	0	.08	12.26	.91
19	.96	.18	.15	.96	.27	.27	.10	0	0	.08	4.17	.56
20	.76	.27	.15	.96	.21	.15	.05	0	0	3.97	2.09	.40
21	11.08	10.20	.15	.76	.18	.21	.05	.05	0	.86	3.97	.51
22	11.67	2.42	.15	1.59	.12	.15	.05	.04	0	.42	2.12	.51
23	14.19	1.42	.12	.96	.10	.15	.05	.04	.10	.38	2.00	.40
24	6.75	2.09	.12	.66	.10	.12	.05	.04	.05	.34	1.34	.29
25	2.42	2.42	.10	.42	.10	.10	.05	.04	.04	1.76	1.16	.22
26	1.42	2.09	.12	.34	.10	.10	.04	.04	.04	.46	1.11	.21
27	.96	.76	23.94	.27	13.84	.05	.04	.27	.04	.34	1.50	.22
28	.76	.34	4.38	.27	1.76	.05	.05	.05	.02	.76	2.42	.24
29	.56	.....	1.92	.21	1.16	.10	.04	.04	0	.86	1.34	.24
30	.56	.....	6.75	.42	.66	.21	.04	.04	.10	.86	.91	.38
31	.96	.....	3.97	.....	.42	.....	.04	.04	.....	1.16	.....	17.69

NOTE.—August 19–20, September 7–22, September 29, and October 4 channel moist, no surface flow.

Monthly discharge of Sylvan Glen Creek near New Hartford, N. Y., for 1906.

[Drainage area, 1.18 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	14.19	0.42	2.21	1.87	2.16
February	10.20	.18	.97	.822	.86
March	23.94	.10	1.67	1.42	1.64
April	10.20	.21	2.99	2.53	2.82
May	13.84	.10	1.68	1.42	1.64
June	11.08	.05	.65	.551	.61
July	7.25	.04	.39	.330	.38
August	.27	0	.05	.042	.05
September	.10	0	.02	.017	.02
October	3.97	0	.63	.534	.62
November	12.26	.16	1.55	1.31	1.46
December	17.69	.21	1.53	1.30	1.50
The year	23.94	0	1.20	1.01	13.76

GRAEFENBERG CREEK NEAR NEW HARTFORD, N. Y.

A gaging weir was erected above the inflow to Graefenberg res voir June 7, 1903, and a standard rain gage placed on the adjoini meadow slope, some distance from trees and structures. The record flow is furnished by the Consolidated Water Company, of Utica, N. The conditions at the station are described in Water-Supply Pap No. 166, page 37, where are given also references to publications th contain data for previous years.

Daily discharge, in second-feet, of Graefenberg Creek near New Hartford, N. Y., for 190

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1	1.24	1.10	0.91	2.22	.....	1.38	1.49	1.10	1.05	1.00	1.05	1.8
2	1.19	1.00	.91	1.92	.....	1.38	1.29	1.00	1.05	1.00	1.05	1.3
3	1.19	.91	1.10	2.45	.....	1.38	1.29	1.14	1.10	1.00	1.00	1.3
4	1.49	.91	1.54	7.64	.....	1.38	1.54	1.14	1.00	1.00	1.00	1.3
5	1.33	.96	1.43	2.72	.....	1.38	1.33	1.10	1.00	2.04	1.00	1.1
6	1.19	.91	1.98	2.65	.....	1.43	1.29	1.10	1.00	1.38	1.00	10.6
7	1.14	.91	.91	2.27	.....	1.38	1.24	1.14	1.00	1.76	.96	1.7
8	1.19	.91	1.43	2.27	.....	2.10	1.19	1.14	1.00	1.14	.96	1.2
9	1.10	1.00	1.19	1.92	.....	1.49	1.81	1.10	1.00	1.38	1.00	1.2
10	1.00	.96	.96	3.06	.....	1.54	1.49	1.10	1.00	1.19	1.05	1.3
11	1.00	.91	.91	4.64	.....	1.43	1.29	1.10	1.00	1.33	1.10	1.2
12	1.19	.91	.91	4.26	.....	1.33	1.19	1.05	1.00	1.24	1.19	1.1
13	1.05	.96	.88	2.92	.....	1.29	1.19	1.05	1.00	1.10	1.19	1.1
14	1.00	1.00	.88	2.79	.....	1.29	1.14	1.10	1.00	1.05	1.19	1.0
15	1.05	.91	.85	4.72	.....	1.29	1.10	1.05	1.00	1.00	1.19	4.1
16	1.70	.91	.85	2.45	.....	1.76	1.10	1.05	1.00	1.00	1.19	1.8
17	1.33	.91	.85	2.04	.....	1.65	1.19	1.05	1.00	1.00	1.19	1.4
18	1.19	.91	.85	1.87	.....	1.60	1.19	1.05	1.00	1.00	4.41	1.2
19	1.14	.91	.88	1.81	.....	1.43	1.14	1.05	1.00	1.00	2.16	1.1
20	1.10	1.38	.91	1.70	.....	1.33	1.10	1.29	1.10	2.27	1.60	1.0
21	4.95	5.69	.91	1.65	.....	1.33	1.10	1.14	1.05	1.29	4.88	1.
22	4.10	1.70	.91	1.92	.....	1.33	1.00	1.05	1.00	1.19	1.81	1.
23	6.44	1.43	.91	1.70	.....	1.33	1.10	1.05	1.29	1.14	1.60	1.
24	1.81	1.65	.91	1.60	.....	1.29	1.10	1.05	1.05	1.05	1.49	1.
25	1.29	1.98	.96	1.54	.....	1.29	1.00	1.05	1.00	1.70	1.38	1.
26	1.19	1.43	1.24	1.54	.....	1.24	1.10	1.05	1.00	1.05	1.38	1.
27	1.10	1.19	12.61	1.49	.....	1.19	1.10	1.38	1.14	1.00	1.54	1.
28	1.10	1.00	2.86	1.49	.....	1.24	1.10	1.14	1.00	1.05	1.70	1.
29	1.00	.....	2.10	1.49	.....	1.29	1.10	1.10	1.00	1.10	1.33	1.
30	1.05	.....	4.80	1.60	.....	1.33	1.10	1.10	1.19	1.10	1.29	1
31	1.10	.....	2.27	.....	.....	.....	1.10	1.05	.....	1.10	.....	7

Monthly discharge of Graefenberg Creek near New Hartford, N. Y., for 1906.

[Drainage area, 0.282 square mile.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inch
January	6.44	1.00	1.58	5.60	[illegible]
February	5.69	.91	1.26	4.47	[illegible]
March	12.61	.85	1.66	5.89	[illegible]
April	7.61	1.49	2.48	8.79	[illegible]
May	.....	.....	.....	.....	.....
June	2.10	1.19	1.40	4.96	[illegible]
July	1.81	1.00	1.21	4.29	[illegible]
August	1.29	1.00	1.10	3.90	[illegible]
September	1.29	1.00	1.03	3.65	[illegible]
October	2.27	1.00	1.21	4.29	[illegible]
November	4.88	.96	1.50	5.32	[illegible]
December	10.66	1.05	1.90	6.74	[illegible]

WEST CANADA CREEK AT TWIN ROCK BRIDGE, NEW YORK.

A current-meter gaging station was established September 7, 1900, at Twin Rock Bridge. The drainage area of the creek above Trenton Falls is 375 square miles. Gage heights taken by George Rood and furnished by the Utica Gas and Electric Company, were used to obtain the daily discharge September 12 to 29 and November 16 to December 31, 1906. For the remainder of the year gage readings taken once a day by Frank McArthur, who is in the employ of the Consolidated Water Company of Utica, were used. These latter readings are from a tape and weight gage, and are reduced to the datum of the board gage used by Mr. Rood. The conditions at the station and the bench marks are described in Water-Supply Paper No. 166, page 41, where are given also references to publications that contain data for previous years.

Discharge measurements of West Canada Creek at Twin Rock Bridge, New York, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 9-10	Horton and Mott	175	527	3.02	412
April 17	E. F. Weeks	168	1,310	6.80	5,540
April 23	do	167	1,330	6.90	5,570
September 19	do	149	256	.37	143
Do	C. C. Covert	157	253	.35	131
October 5	E. F. Weeks	152	313	.75	265
October 23	Barrows and Covert	159	460	1.61	479

[a] Measurement made under ice cover. Average ice thickness, 1.35 feet. Gage height to under surface of ice, 1.84 feet.

Daily gage height, in feet, of West Canada Creek at Twin Rock Bridge, New York, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.86	4.08	3.05	3.88	3.87	1.69	3.89	1.86	0.69	1.58	1.80	2.05
2	3.31	3.54	2.84	3.08	3.62	1.54	4.11	1.25	.61	.98	1.66	1.80
3	2.99	2.95	2.66	2.54	5.48	1.41	3.07	1.01	.58	.78	1.51	1.55
4	3.26	3.18	3.97	2.67	5.39	1.41	2.76	.87	.99	.69	1.41	1.65
5	3.99	3.44	4.34	3.81	4.32	1.20	3.06	3.00	.86	.68	1.55	1.50
6	4.06	3.09	4.05	3.66	3.96	1.21	2.31	2.03	.73	.71	1.20	2.10
7	3.69	3.14	3.65	2.90	2.92	1.83	1.86	1.58	.67	.93	1.11	1.00
8	3.52	3.11	3.23	2.70	2.27	1.75	1.57	1.22	.61	.75	.98	1.00
9	3.21	3.14	2.97	2.41	2.14	2.54	1.51	.90	.59	1.11	.85	1.50
10	3.17	3.05	3.08	2.26	2.12	2.01	2.30	.81	1.06	1.65	.91	1.60
11	3.17	2.99	2.37	2.18	2.46	2.51	2.92	.70	.49	2.01	.97	1.55
12	3.59	2.96	2.53	2.32	2.04	1.99	2.11	.72	.50	1.93	1.51	1.40
13	3.37	2.88	2.12	2.42	2.06	1.63	1.61	1.08	.50	1.65	1.22	1.35
14	3.43	2.95	2.05	2.94	5.35	1.43	1.32	.83	.50	1.46	2.22	1.60
15	3.75	2.83	1.91	7.89	3.82	1.24	1.19	.68	.50	1.50	1.87	1.75
16	3.69	2.68	1.90	8.95	2.69	1.21	1.01	.63	.50	1.07	1.00	2.85
17	3.71	2.70	1.90	7.29	2.01	1.10	1.01	.59	.50	1.16	.70	3.35
18	3.57	2.67	1.65	6.84	2.46	2.83	.99	.55	.50	.91	1.80	2.00
19	3.46	2.74	1.65	7.06	2.39	1.97	.92	.55	.45	.82	4.00	2.60
20	3.53	2.63	1.66	7.11	2.46	1.63	.95	.51	.45	1.87	5.00	2.50
21	3.54	2.70	1.84	7.41	1.93	1.41	.78	.78	.30	2.80	3.60	2.40
22	3.95	3.73	1.81	7.36	1.72	1.41	.49	1.58	.40	2.83	3.80	2.10
23	5.93	4.18	1.64	7.49	1.61	1.63	.75	1.04	2.15	1.87	2.85	2.00
24	10.45	3.93	1.67	5.15	1.53	2.06	.72	.75	1.35	1.45	3.30	2.05
25	7.95	3.85	1.66	3.44	1.80	1.82	.71	.67	.75	1.36	3.80	2.00
26	6.36	4.25	1.68	2.78	1.87	1.49	.66	1.27	.60	2.19	2.00	1.75
27	5.59	3.86	1.83	3.73	2.03	1.28	.62	1.21	.50	2.08	2.55	2.10
28	5.13	3.54	4.69	2.80	3.77	1.08	.64	2.32	.70	2.29	2.75	1.60
29	4.52	.....	*4.57*	*3.81*	*3.22*	.93	1.26	1.66	.80	2.33	3.00	1.55
30	*4.07*	.....	*4.27*	*3.99*	*2.37*	1.23	1.46	1.10	.....	2.06	2.25	1.70
31	*4.37*	.....	*4.40*	.....	*1.89*	.....	2.26	.79	.....	2.02	.....	1.90

Rating table for West Canada Creek at Twin Rock Bridge, New York, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.30	130	1.70	563	3.10	1,400	5.00	3,230
0.40	150	1.80	609	3.20	1,480	5.20	3,470
0.50	170	1.90	655	3.30	1,560	5.40	3,710
0.60	196	2.00	701	3.40	1,640	5.60	3,950
0.70	222	2.10	756	3.50	1,720	5.80	4,190
0.80	249	2.20	812	3.60	1,800	6.00	4,430
0.90	275	2.30	868	3.70	1,880	6.20	4,710
1.00	302	2.40	924	3.80	1,960	6.40	4,990
1.10	336	2.50	980	3.90	2,040	6.60	5,270
1.20	370	2.60	1,040	4.00	2,130	6.80	5,550
1.30	404	2.70	1,100	4.20	2,330	7.00	5,830
1.40	438	2.80	1,160	4.40	2,530	8.00	7,230
1.50	472	2.90	1,240	4.60	2,750	9.00	8,730
1.60	517	3.00	1,320	4.80	2,990	10.00	10,330

NOTE.—The above table is applicable only for open-channel conditions. It is based on disc measurements made during 1905–6, and is well defined between gage heights 0.3 feet and 2.2 fee

Monthly discharge of West Canada Creek at Twin Rock Bridge, New York, for 19

[Drainage area, 364 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
April	8,660	801	2,980	8.19	
May	3,810	485	1,340	3.68	
June	1,180	283	549	1.51	
July	2,240	168	636	1.75	
August	1,320	173	372	1.02	
September	781	130	232	.637	
October	1,180	217	529	1.45	
November	3,230	222	890	2.45	

NOTE.—Above values are rated as approximate.

WEST CANADA CREEK AT KAST BRIDGE, NEW YORK.

This station was established May 15, 1905. It is located on bridge opposite the railway station at Kast Bridge, New York, at 4 miles along the stream above the mouth of the creek at Herkin The conditions and the bench marks are described in Water-Sup Paper No. 166, page 44, where are given also references to publ tions that contain data for previous years.

Discharge measurements of West Canada Creek at Kast Bridge, New York, in 190

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Disch
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
April 5	D. L. Mott	196	745	30.58	
September 18	E. F. Weeks	171	296	28.22	
October 4	do	170	295	28.27	
October 13	do	170	404	28.86	
October 19	do	170	292	28.32	
November 20	do	197	712	30.53	
November 22	do	197	598	29.95	

Daily gage height, in feet, of West Canada Creek at East Bridge, New York, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	29.85	29.42	29.22	30.38	30.62	28.92	30.62	28.92	28.32	28.45	28.99	29.39
2	29.52	29.08	29.10	30.05	30.40	28.70	30.65	28.68	27.90	28.55	28.74	28.87
3	29.35	28.70	28.92	29.85	31.70	28.58	29.95	28.50	27.48	28.42	28.63	28.80
4	29.48	28.52	30.18	30.12	30.70	28.52	29.50	28.72	28.30	28.38	28.62	28.43
5	30.00	28.90	30.05	30.75	31.02	28.52	29.80	29.62	28.38	28.46	28.56	28.72
6	29.85	28.75	29.75	30.60	30.60	28.72	29.38	29.18	28.18	28.42	28.56	29.27
7	29.40	28.85	29.60	30.15	30.25	28.82	29.02	29.00	28.18	28.66	28.48	29.40
8	29.28	28.88	29.35	29.95	29.68	28.98	28.80	28.62	28.18	28.88	28.45	28.79
9	29.05	28.92	29.38	29.88	29.70	29.42	29.02	28.42	28.12	28.66	28.41	28.88
10	29.10	28.95	29.50	29.55	29.72	29.32	29.62	28.45	27.92	28.80	28.48	28.85
11	29.05	28.88	28.95	30.05	29.60	29.35	29.75	28.20	28.12	29.30	28.63	28.84
12	29.22	28.90	29.00	30.38	29.35	29.18	29.28	28.25	28.10	29.10	28.92	28.70
13	29.18	28.98	28.72	30.20	29.30	28.82	28.95	28.12	27.65	28.88	28.83	28.75
14	29.02	28.88	28.78	30.55	30.60	28.70	28.70	28.68	27.90	28.72	28.86	28.78
15	29.02	28.85	28.55	33.68	30.58	28.58	28.60	28.38	27.98	28.56	29.27	29.89
16	29.10	28.88	28.72	33.38	29.80	28.68	28.52	28.12	28.08	28.56	28.74	30.30
17	29.12	28.90	28.78	32.45	29.45	29.08	28.60	28.12	27.90	28.42	28.62	30.25
18	29.05	28.82	28.62	32.08	29.55	29.92	28.52	27.98	28.20	28.40	29.08	29.75
19	29.08	28.80	28.60	32.18	29.40	29.22	28.45	28.00	28.05	28.34	30.47	29.30
20	29.00	28.78	28.55	32.30	29.60	28.80	28.35	27.90	27.95	29.90	30.48	29.15
21	29.25	29.82	28.55	32.35	29.20	28.72	28.22	28.60	28.12	29.80	29.94	29.20
22	30.78	30.45	28.60	32.40	28.92	28.70	28.28	28.50	28.18	29.76	30.00	29.10
23	32.45	30.05	28.50	32.40	28.85	28.90	28.30	28.52	28.58	29.18	30.32	28.95
24	33.12	29.88	28.50	31.40	28.80	29.10	28.28	28.40	28.85	28.74	29.72	28.70
25	31.85	30.00	28.60	30.48	28.85	29.08	28.18	28.20	28.58	28.95	29.57	28.61
26	30.92	30.30	28.70	29.95	28.95	28.75	28.18	28.05	28.35	29.12	29.29	28.72
27	30.05	29.62	30.70	30.45	29.75	28.58	28.05	28.22	28.35	29.12	29.58	28.73
28	29.65	29.30	31.48	29.93	30.48	28.58	28.30	28.15	28.28	29.18	29.92	28.76
29	29.50	.....	30.75	30.58	30.15	28.55	28.40	28.10	28.35	29.28	29.77	28.70
30	30.48	.....	30.75	30.50	29.55	28.62	28.45	28.52	28.42	29.23	29.38	28.67
31	29.45	.....	31.20	.....	29.08	.....	29.08	28.45	.....	29.30	.....	30.35

NOTE.—Ice conditions February 2 to 21; gage heights to water surface in hole in ice. No ice at gage during December; ice along shore above and below gage from 10 to 30 feet wide and 0.15 to 0.35 foot thick.

EAST CANADA CREEK AT DOLGEVILLE, N. Y.

Observations are taken at High Falls, near Dolgeville, about 7 miles from the outlet of the stream. The gaging station is located at the dam of the Herkimer County Light and Power Company.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York, and in Water-Supply Paper No. 166, page 45, where are given also references to publications that contain data for previous years

Daily discharge in second-feet of East Canada Creek at Dolgeville, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	I
1	260	484	a 280	1,000	951	471	1,070	468	92	213	997	
2	433	214	210	962	1,140	409	1,010	172	63	142	759	
3	423	209	159	850	2,680	383	851	191	240	160	179	
4	312	a 250	742	817	2,180	340	619	145	124	153	165	
5	348	290	517	1,400	1,600	265	745	83	132	110	192	
6	288	b 208	517	1,310	1,380	288	402	358	136	95	170	
7	105	b 275	a 369	1,090	a 1,103	234	378	351	95	383	175	
8	218	224	221	795	826	366	491	176	100	284	180	
9	263	252	316	715	893	420	584	163	85	154	170	
10	b 218	219	138	380	1,010	406	565	162	123	279	200	
11	b 221	a 240	a 176	869	938	456	519	176	90	370	171	
12	326	261	214	830	816	392	449	114	95	434	281	
13	230	b 238	230	1,130	748	259	272	121	95	384	244	
14	142	b 224	214	2,020	675	208	326	121	100	285	238	
15	218	255	213	5,760	768	158	328	108	85	195	203	
16	195	192	224	4,800	739	175	205	112	85	170	170	
17	200	110	148	4,170	606	330	190	74	95	127	156	
18	200	a 147	115	3,460	545	508	200	82	90	120	149	
19	185	185	193	3,710	452	270	185	61	85	183	769	
20	175	191	209	3,620	540	248	144	165	80	954	977	
21	102	319	184	3,230	470	231	130	175	105	580	914	
22	714	434	189	3,620	370	250	80	195	100	404	1,150	
23	2,380	376	193	2,910	394	258	158	134	309	826	982	
24	2,870	260	157	2,100	366	220	148	129	123	167	693	
25	1,500	341	174	1,670	356	395	160	105	105	175	576	
26	1,230	432	179	1,390	330	209	155	85	105	551	481	
27	1,050	422	171	1,210	a 950	459	128	305	105	279	476	
28	842	a 351	1,230	1,040	1,570	609	150	459	181	461	691	
29	780	.....	1,290	864	826	238	245	204	146	403	658	
30	550	.....	1,080	950	1,050	227	409	63	207	429	617	
31	501	.....	1,430	.....	640	.....	604	200	.....	468	.....	

a Record incomplete; values interpolated. b Crest of dam obstructed by ice.

NOTE.—Ice went out of dam April 5 to 6.

Monthly discharge at East Canada Creek at Dolgeville, N. Y., for 1906.

[Drainage area, 256 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inch
January	2,870	102	564	2.20	
February	484	110	272	1.06	
March	1,430	115	377	1.47	
April	5,760	380	1,960	7.66	
May	2,680	330	900	3.52	
June	609	158	323	1.26	
July	1,070	80	384	1.50	
August	468	61	176	.688	
September	309	63	119	.465	
October	954	95	321	1.25	
November	1,150	119	459	1.79	
December	838	105	411	1.61	
The year	5,760	61	522	2.04	

NOTE.—Values April to November, good; January to March, fair; December, fair.

SCHOHARIE CREEK AT PRATTSVILLE, N. Y.

This station was established November 7, 1902, at the highw bridge in the village of Prattsville. During 1906 the gage was re twice each day by Edna M. Snyder. The conditions at the station a the bench marks are described in Water-Supply Paper No. 166, pa *47, where are given also* references to publications that contain da *previous years.*

Discharge measurements of Schoharie Creek at Prattsville, N. Y., in 1906.

e.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
5.....	C. C. Covert	62.5	46	4.25	a41
er 3 ...	do	180	483	4.62	137

a Made by wading one-fourth mile below bridge.

Daily gage height, in feet, of Schoharie Creek at Prattsville, N. Y., for 1906.

y.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.95	4.95	5.27	5.52	5.07	5.61	4.95	4.30	4.30	4.22	4.70	4.92
.....	5.00	4.90	5.27	5.37	5.01	5.46	4.70	4.35	4.30	4.20	4.60	4.90
.....	5.10	4.80	5.17	5.27	4.96	5.21	4.85	4.30	4.30	4.20	4.60	5.00
.....	5.20	4.80	7.85	5.37	4.96	5.08	4.95	4.30	4.30	4.20	4.60	5.00
.....	5.25	4.70	5.85	6.25	4.96	5.01	4.82	4.40	4.25	4.20	4.55	5.10
.....	5.05	4.70	5.37	6.62	4.91	5.31	4.65	4.40	4.20	4.20	4.50	5.55
.....	5.25	4.70	5.29	5.92	5.38	5.08	4.60	4.75	4.18	4.20	4.50	5.50
.....	5.45	4.72	5.22	5.72	5.41	4.94	4.52	4.90	4.18	4.20	4.50	5.10
.....	5.40	4.72	5.17	5.59	5.56	5.02	4.52	4.55	4.15	4.20	4.45	5.52
.....	5.38	4.80	5.17	7.67	5.38	5.25	4.52	4.45	4.15	4.28	4.45	5.60
.....	5.45	4.80	5.27	7.12	5.24	5.35	4.52	4.40	4.15	4.30	4.50	5.75
.....	5.60	4.80	5.27	6.22	5.16	5.05	4.45	4.32	4.15	4.30	4.58	5.60
.....	5.50	4.80	5.27	6.42	5.11	4.85	4.40	4.25	4.15	4.30	4.55	5.40
.....	5.50	4.90	5.27	9.57	5.06	4.85	4.38	4.25	4.18	4.22	4.55	5.40
.....	5.40	4.90	5.27	7.52	5.01	4.75	4.32	4.22	4.10	4.20	4.55	5.30
.....	5.40	4.90	5.27	6.87	4.96	4.82	4.30	4.20	4.10	4.20	4.75	5.30
.....	5.25	4.95	5.07	6.72	4.91	5.45	4.35	4.22	4.05	4.20	4.65	5.15
.....	5.10	5.00	4.77	6.42	4.86	5.50	4.42	4.20	4.08	4.20	5.68	5.10
.....	5.00	4.97	4.77	6.27	4.88	5.60	4.30	4.20	4.05	4.20	7.08	5.20
.....	4.95	4.92	4.82	6.17	4.84	5.42	4.35	4.12	4.08	5.68	6.22	5.30
.....	5.15	4.95	4.99	6.02	4.76	5.15	4.28	4.40	4.18	5.32	6.10	5.40
.....	5.38	5.99	5.02	5.82	4.78	5.18	4.25	4.45	4.40	5.18	5.95	5.20
.....	5.70	6.15	5.02	5.72	4.74	5.18	4.32	4.40	4.45	4.95	5.75	5.10
.....	7.05	5.37	4.99	5.57	4.71	5.08	4.35	4.30	4.32	4.80	5.45	5.10
.....	5.65	5.47	4.87	5.47	4.66	4.88	4.28	4.20	4.22	6.10	5.30	5.00
.....	5.40	5.97	4.87	5.37	4.71	4.78	4.22	4.20	4.20	5.50	5.18	5.00
.....	5.35	5.87	8.50	5.27	6.14	4.70	4.28	4.90	4.18	5.05	5.12	5.00
.....	5.20	5.39	7.32	5.17	8.16	4.62	4.28	5.10	4.20	5.00	5.10	4.90
.....	5.12	.....	5.79	5.07	7.51	4.60	4.32	4.95	4.20	4.90	5.00	4.90
.....	5.08	.....	5.69	5.07	6.31	4.48	4.30	4.50	4.28	4.80	5.00	5.00
.....	5.00	.....	5.67	.....	5.84	.....	4.30	4.38	.....	4.72	.....	5.70

.—Ice conditions January 7-21, February 3-22, February 28-March 3, and March 20-26. Ice 5 foot thick. River frozen over from December 4 to 31. Ice from 0.30 to 0.75 foot thick. The ng comparative readings were taken:

Comparative ice and water readings.

Date.	Thickness of ice at gage.	Gage reading to water surface.	Gage reading to top of ice.
	Feet.	*Feet.*	*Feet.*
ber 19	0.38	5.1	5.2
ber 22	.25	5.1	5.2
ber 26	.83	4.9	5.0
ber 29	.75	4.9	4.9

mber 31 ice went out of river at station. During frozen period for January, February, and the readings were taken to the water surface through a hole cut in the ice.
readings for frozen period during December were to top of ice, with readings to water surface h a hole cut in the ice on Wednesday and Saturday of each week.

Rating table for Schoharie Creek at Prattsville, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.05	11	5.10	345	6.20	1,170	7.60	2,990
4.10	18	5.20	405	6.30	1,270	7.80	3,300
4.20	28	5.30	465	6.40	1,370	8.00	3,620
4.30	42	5.40	525	6.50	1,470	8.20	3,960
4.40	61	5.50	585	6.60	1,600	8.40	4,300
4.50	85	5.60	663	6.70	1,720	8.60	4,640
4.60	125	5.70	741	6.80	1,850	8.80	4,980
4.70	165	5.80	819	6.90	1,970	9.00	5,320
4.80	205	5.90	897	7.00	2,100	9.20	5,680
4.90	245	6.00	975	7.20	2,390	9.40	6,040
5.00	285	6.10	1,070	7.40	2,680	9.60	6,400

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904–1906, and is well defined between gage heights 4.1 feet and 8.0 feet.

Monthly discharge of Schoharie Creek at Prattsville, N. Y., for 1906.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	6,350	327	1,250	5.21	5.81
May	3,890	149	578	2.41	2.78
June	671	80	350	1.46	1.63
July	265	31	87.5	.365	.42
August	345	20	82.0	.342	.39
September	73	14	30.0	.125	.14
October	1,070	28	178	.742	.86
November	2,230	73	384	1.60	1.78

NOTE.—Values are rated as follows: September, good; April to August and October to November, excellent.

KINDERHOOK CREEK AT ROSSMAN, N. Y.

Kinderhook Creek is an interstate stream, having its source in the Hancock Mountains, Massachusetts. It flows southwesterly through Columbia and Rensselaer counties, N. Y., and joins Claverack Creek about 2 miles from the Hudson River, forming Stockport Creek, through which it discharges its water into the Hudson, 4 miles north of the village of Hudson.

The topography of the basin is shown on the Troy, Berlin, Pittsfield, Kinderhook, and Coxsackie sheets of the United States Geological Survey topographic atlas, from which the following drainage areas have been determined:

Drainage areas of Kinderhook Creek.

Point of measurement.	Area.	Total area.
	Sq. miles.	*Sq. miles.*
Kinderhook Creek above Garfield	39.3	39.3
Kinderhook Creek from Garfield to Wyomanock Creek	34.8	74.1
Wyomanock Creek above mouth	31.3	105.4
Kinderhook Creek from Wyomanock Creek Junction to Valatie Kill	167.2	272.6
Valatie Kill above Kinderhook Lake	37.6	.....
Kinderhook Lake	2.7	.....
Valatie Kill from Kinderhook Lake to mouth	3.9	.....
Valatie Kill above mouth	44.2	316.8
Kinderhook Creek from Valatie Kill to gaging station at Rossman	14.3	331.1
Kinderhook Creek from gaging station to Claverack Creek	6.4	337.5

gaging station was established March 17, 1906, at the highway near Rossman post-office, about 7 miles northeast of Hudson, bia County, N. Y., on the line of the Albany and Hudson Elec- ilroad, and about one-eighth mile below Chittenden Falls and a of the Rossman Paper and Woven Wire Fence Mills.

x gage of the tape and weight type is located on the upstream the highway bridge, 50 feet from the right-hand end; length of d weight, 50 feet. The gage is read morning, noon, and night sley Ham. The bench mark is a ½-inch bolt painted white, in the downstream side of a large elm tree about 30 feet from ht-hand abutment, downstream side of bridge; elevation, 47.65 ove zero of gage.

mation in regard to this creek is published in Supplement to ork State Engineer's Report, 1902, pages 252–256.

Discharge measurements of Kinderhook Creek at Rossman, N. Y., in 1906.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	Covert and Weeks	137	149	27.05	262
.....	do	148	206	27.35	420
.....	C. C. Covert	133	123	26.90	188
c.....	do	130	195	26.67	424
b....	E. F. Weeks	147	170	27.25	319
2...	C. C. Covert	147	187	27.29	318

obstruction by ice. *b* Upstream side of bridge. *c* Wading about 100 feet below bridge.

ily gage height, in feet, of Kinderhook Creek at Rossman, N. Y., for 1906.

ay.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	.....	28.26	27.63	27.66	27.52	27.04	26.71	26.72	27.26	27.31
.....	.....	28.11	27.42	27.57	27.60	27.06	26.68	26.72	27.28	27.22
.....	.....	27.96	27.72	27.37	27.65	27.00	26.66	26.71	27.23	27.18
.....	.....	27.87	27.57	27.27	27.49	26.97	26.69	26.74	27.05	27.12
.....	.....	28.10	27.62	27.25	27.52	27.00	26.80	26.72	26.93	27.09
.....	.....	28.48	27.53	28.29	27.38	26.92	26.73	26.62	26.94	27.02
.....	.....	28.38	27.51	28.21	27.20	27.33	26.73	26.64	26.94	27.88
.....	.....	28.09	27.48	27.84	27.08	27.30	26.65	26.51	26.92	27.77
.....	.....	28.09	27.48	27.74	27.06	27.33	26.56	26.66	26.93	27.73
.....	.....	28.82	28.20	27.60	27.02	26.93	26.71	26.66	26.83	27.68
.....	.....	29.59	27.76	27.77	26.97	26.98	26.72	26.70	26.78	27.64
.....	.....	29.17	27.60	27.59	26.85	26.82	26.68	26.73	27.29	27.47
.....	.....	28.87	27.57	27.48	26.76	26.78	26.59	26.92	27.32	27.42
.....	.....	28.52	27.49	27.22	26.76	26.76	26.49	26.82	27.28	27.18
.....	.....	30.01	27.41	27.22	26.82	26.77	26.51	26.83	27.21	27.42
.....	.....	30.63	27.32	27.22	26.70	26.72	26.44	26.82	27.24	27.40
.....	27.37	29.57	27.31	27.28	26.70	26.72	26.60	26.71	27.21	27.41
.....	27.33	29.01	27.42	27.28	26.72	26.70	26.52	26.73	27.17	27.42
.....	27.29	28.56	27.37	27.20	26.89	26.74	26.51	26.71	28.39	27.07
.....	27.29	28.41	27.23	27.16	26.75	26.51	26.52	27.20	28.24	26.97
.....	27.27	28.21	27.24	27.01	26.72	26.57	26.51	28.06	28.15	26.93
.....	27.28	28.10	27.24	27.15	26.50	26.58	26.52	27.79	28.10	27.11
.....	27.11	28.05	27.24	26.95	26.77	26.57	26.52	27.55	27.93	27.20
.....	27.03	28.20	27.24	26.68	26.71	26.57	26.69	27.34	27.78	27.03
.....	27.01	28.01	27.09	26.86	26.73	26.59	26.74	27.31	27.61	27.12
.....	27.12	27.87	27.07	26.89	26.78	26.70	26.72	27.32	27.48	27.04
.....	28.96	27.72	26.80	26.81	26.73	26.59	26.63	27.33	27.40	27.06
.....	30.01	27.69	28.39	26.79	26.67	26.80	26.67	27.20	27.42	27.05
.....	28.92	27.52	28.84	26.72	26.66	26.79	26.70	27.11	27.42	27.12
.....	28.56	27.54	28.31	26.72	26.72	26.80	26.50	27.22	27.34	27.13
.....	28.57	.....	27.93	.....	26.84	26.80	.....	27.28	.....	28.97

station is about one-fourth mile below a dam. Very little obstruction from ice, except in *ld weather.*

CATSKILL CREEK AT SOUTH CAIRO, N. Y.

The gaging station was established July 4, 1901, at the highw bridge in village of South Cairo. The conditions and the bench ma are described in Water-Supply Paper No. 166, page 49, where are gi also references to publications that contain data for previous years.

Discharge measurements of Catskill Creek at South Cairo, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discha
		Feet.	*Sq. ft.*	*Feet.*	*Sec.*
February 16[a]	Horton and Mott	100	190	2.82	
June 7	C. C. Covert	160	347	3.35	
August 21[b]	do	58	47	2.25	
September 9[c]	do	20	14	2.10	
Do.[c]	do	2[illegible]	13	2.09	

[a] Measurement made under ice cover, average thickness of ice 0.70 feet. Gage height to botto ice 2.22 feet.
[b] Made by wading 1,000 feet above bridge.
[c] Made by wading one-fourth mile below bridge.

Daily gage height, in feet, of Catskill Creek at South Cairo, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	3.12	3.05	4.61	4.46	3.15	3.81	4.60	2.20	2.10	2.02	2.42	3
2	3.05	3.05	4.29	4.21	3.00	3.49	3.70	2.12	2.12	1.95	2.18	3
3	3.25	2.90	4.12	4.16	3.55	3.32	4.60	2.10	2.00	1.95	2.10	3
4	3.40	3.00	8.52	4.21	3.45	3.19	4.20	2.10	2.05	1.95	2.20	3
5	3.50	3.00	5.37	5.58	3.25	3.12	3.40	2.10	1.90	2.25	2.32	3
6	3.15	2.98	3.97	5.98	3.15	3.14	2.78	2.18	2.08	2.25	2.30	3
7	3.22	2.80	3.67	4.86	3.15	3.27	2.85	2.20	2.02	2.15	2.25	4
8	3.30	2.70	3.62	4.46	3.04	3.12	2.60	2.20	2.05	2.00	2.35	4
9	3.31	2.70	3.92	4.71	2.95	2.98	2.72	2.55	2.05	2.00	2.35	4
10	3.00	2.70	4.07	6.16	3.15	3.15	2.70	2.45	1.98	2.02	2.35	4
11	3.00	2.80	3.57	7.34	3.05	3.30	2.72	2.22	1.95	2.05	2.35	4
12	2.90	2.80	3.52	6.41	2.95	3.00	2.55	2.05	2.40	2.05	2.35	3
13	3.25	2.80	3.32	5.66	2.85	3.65	2.45	2.30	1.90	2.02	2.50	2
14	2.95	2.75	3.07	5.74	2.75	2.60	2.40	2.20	2.00	2.05	2.40	2
15	2.82	2.80	3.27	7.91	2.75	2.57	2.52	2.10	1.95	2.05	2.45	3
16	2.85	2.80	3.27	6.36	2.67	2.55	2.20	2.10	2.00	1.98	2.40	3
17	3.25	2.78	3.07	5.31	2.60	3.88	2.45	2.10	2.00	1.95	2.48	3
18	3.20	2.80	2.87	4.86	2.63	4.05	2.60	2.10	1.95	2.02	2.75	3
19	2.95	2.78	2.95	4.58	2.70	3.70	2.42	2.00	1.95	2.05	5.45	2
20	2.90	2.75	3.67	4.51	2.60	3.52	2.25	1.95	1.95	2.32	4.80	3
21	2.88	2.88	3.17	4.14	2.45	3.20	2.32	2.10	1.95	2.80	4.55	3
22	3.75	5.10	3.02	3.98	2.64	3.25	2.10	1.90	2.05	2.55	4.55	3
23	4.20	4.20	2.97	3.81	2.37	2.95	2.22	2.25	2.00	2.52	4.18	3
24	5.15	4.07	2.89	3.68	2.39	2.95	2.30	2.20	2.05	2.35	3.75	3
25	4.00	4.12	2.82	3.50	2.54	2.85	2.18	2.10	2.05	2.65	3.40	[illegible]
26	3.60	4.92	6.11	3.35	2.56	2.72	2.12	2.20	2.00	2.55	3.42	[illegible]
27	3.42	4.02	8.91	3.27	4.19	2.35	2.15	2.25	2.00	2.48	3.40	[illegible]
28	3.32	3.97	9.21	3.17	7.54	2.38	2.00	2.08	1.95	2.45	3.50	[illegible]
29	3.30	.....	6.34	3.05	6.49	2.45	2.00	2.35	2.05	2.45	3.42	[illegible]
30	3.18	.....	4.86	3.05	4.79	2.40	2.10	2.10	1.98	2.45	3.18	[illegible]
31	3.10	.....	5.61	.....	4.34	.....	2.18	2.10	.....	2.42	.....	[illegible]

NOTE.—Creek frozen over January 2 to February 22; ice thickness varied from 0.2 to 0.8 foot. 'Re ings for this period are to water surface in hole cut in ice.

During the frozen period of December regular readings are to the top of the ice.

ESOPUS CREEK AT KINGSTON, N. Y.

This station was established July 5, 1901, at the Washington Str *Bridge over Esopus* Creek at Kingston. The conditions and the be

marks are described in Water-Supply Paper No. 166, page 52, where are given also references to publications that contain data for previous years.

Discharge measurements of Esopus Creek at Kingston, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 15[a]	Horton and Mott	90	287	5.60	250
August 23	C. C. Covert	87	224	4.50	151

[a] Measurement made under ice cover. Average thickness of ice 0.33 foot. Gage height to bottom of ice 5.17 feet.

Daily gage height, in feet, of Esopus Creek at Kingston, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.40	6.12	6.50	8.32	6.24	7.18	5.58	4.75	4.25	4.25	5.72	5.60
2	6.12	6.05	6.47	7.99	6.11	6.82	5.65	4.52	4.04	4.08	5.52	5.50
3	5.92	5.89	6.23	7.42	6.28	6.60	5.75	4.48	4.04	4.05	5.32	5.42
4	7.05	5.42	14.55	7.28	6.20	6.16	7.25	5.05	4.28	3.98	5.18	5.25
5	7.52	5.99	9.65	7.75	6.20	5.98	5.94	5.12	4.12	3.98	5.18	5.12
6	6.90	5.59	8.27	8.63	6.04	6.10	5.66	5.70	4.12	3.98	5.05	5.62
7	6.47	5.75	7.80	8.25	6.04	5.92	5.42	5.18	4.12	3.98	4.98	6.88
8	7.20	5.75	7.39	7.85	6.00	5.68	5.12	5.50	4.02	3.88	4.88	5.84
9	7.36	5.67	7.21	7.61	6.22	5.58	5.04	5.21	3.94	4.12	4.62	5.62
10	6.55	5.62	7.00	9.33	6.69	6.10	5.35	4.75	3.78	4.02	4.85	5.92
11	6.42	5.59	6.55	11.48	6.49	5.88	5.28	4.78	4.02	4.08	4.92	6.12
12	6.72	5.56	6.57	10.67	6.27	5.68	5.05	4.75	3.92	4.08	5.88	6.00
13	7.05	5.60	6.13	9.92	6.16	5.52	4.88	4.58	3.92	4.00	5.55	5.70
14	6.42	5.60	6.17	9.55	6.11	5.34	4.80	4.48	3.98	3.92	5.30	5.68
15	6.11	5.55	6.65	16.01	5.91	5.28	4.68	4.40	3.95	3.85	5.15	5.62
16	6.21	5.36	7.41	13.75	5.86	5.92	4.62	4.38	3.94	3.86	5.20	6.53
17	6.20	5.56	6.73	11.21	5.76	7.50	4.66	4.25	3.82	3.80	5.08	6.00
18	6.10	5.22	5.97	9.85	5.65	7.42	4.84	4.22	3.95	3.75	5.08	5.99
19	5.88	5.38	6.16	9.33	5.63	8.92	4.70	4.20	3.95	3.72	7.92	5.60
20	5.70	5.41	6.46	8.93	5.51	8.85	4.52	4.15	3.95	6.88	8.02	5.35
21	5.60	5.58	6.14	8.45	5.46	7.88	4.72	4.68	4.05	7.00	7.62	6.92
22	5.85	9.21	5.54	8.05	5.36	8.52	4.75	4.98	4.32	6.25	7.60	6.52
23	7.08	7.94	5.49	7.92	5.25	7.92	4.60	4.60	5.08	5.82	7.25	5.90
24	9.55	7.36	5.44	7.80	5.23	7.59	4.68	4.55	4.52	5.60	6.68	5.35
25	8.66	7.26	5.32	7.32	5.66	7.10	4.44	4.38	4.35	8.06	6.52	5.10
26	7.92	8.21	5.29	7.04	5.39	6.61	4.44	4.55	4.18	8.45	6.38	5.88
27	7.47	7.41	5.79	6.80	5.33	6.25	4.38	4.20	4.10	7.32	6.18	5.66
28	7.07	6.84	9.09	6.62	9.25	6.05	4.28	4.62	4.00	6.72	5.95	5.69
29	6.77	.....	8.36	6.34	9.30	5.85	4.28	4.38	4.05	6.40	5.78	5.60
30	6.55	.....	8.29	6.30	9.38	5.60	4.36	4.32	4.15	6.08	5.70	5.75
31	6.45	.....	9.04	.....	7.74	.....	4.80	4.22	.....	5.82	.....	8.42

NOTE.—Ice conditions January 8-19, February 3 to March 3, March 16-26. Ice thickness varied from 0.1 to 0.5 foot. Slight ice gorging at times. Also ice conditions December 9 to 31. No ice at gage, but ice 0.1 to 0.7 foot thick above and below bridge. Ice broke up December 31. During frozen period readings were to water surface in hole cut in ice.

Rating tables for Esopus Creek at Kingston, N. Y.

OPEN-CHANNEL CONDITIONS, 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.70	36	5.10	285	6.50	700	8.80	1,820
3.80	49	5.20	309	6.60	741	9.00	1,940
3.90	63	5.30	334	6.70	782	9.20	2,074
4.00	77	5.40	358	6.80	823	9.40	2,208
4.10	94	5.50	383	6.90	864	9.60	2,348
4.20	110	5.60	412	7.00	905	9.80	2,495
4.30	127	5.70	441	7.20	995	10.00	2,642
4.40	143	5.80	469	7.40	1,085	11.00	3,440
4.50	160	5.90	498	7.60	1,179	12.00	4,340
4.60	180	6.00	527	7.80	1,276	13.00	5,305
4.70	200	6.10	562	8.00	1,373	14.00	6,280
4.80	220	6.20	596	8.20	1,480	15.00	7,310
4.90	240	6.30	631	8.40	1,587	16.00	8,390
5.00	260	6.40	665	8.60	1,700		

[a] The above table is applicable only for open-channel conditions. It is based on discharg urements made during 1901-1906 and is well defined between gage heights 3.8 feet and 11.0 fe extension is based on 2 measurements above 11.0 feet.

ICE PERIOD, 1906.

5.10	217	5.90	387	6.70	608	8.00	1,14
5.20	237	6.00	410	6.80	641	8.20	1,24
5.30	257	6.10	436	6.90	674	8.40	1,34
5.40	277	6.20	463	7.00	707	8.60	1,45
5.50	297	6.30	489	7.20	787	8.80	1,56
5.60	320	6.40	516	7.40	868	9.00	1,68
5.70	342	6.50	542	7.60	955		
5.80	365	6.60	575	7.80	1,048		

Monthly discharge of Esopus Creek at Kingston, N. Y., for 1906.

[Drainage area, 324 square miles.]

Month.	Discharge in second-feet.			Run-off
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
January	2,310	383	776	2.40
February	1,800	241	517	1.60
March	6,840	255	1,040	3.21
April	8,410	631	2,040	6.30
May	2,190	316	687	2.12
June	1,890	329	793	2.45
July	1,020	124	276	.852
August	441	102	194	.599
September	280	46	94.7	.292
October	1,610	39	361	1.11
November	1,380	184	528	1.63
December	1,600	217	436	1.35
The year	8,410	39	645	1.99

NOTE.—Values are rated as follows: January, March, and December, fair, February, appr April to July, October and November, excellent; August and September, good.

ESOPUS CREEK NEAR OLIVE BRIDGE, N. Y.

During 1906 a weir for the purpose of measuring the flow Esopus Creek has been constructed near Olive Bridge, N. Y., board of water supply of the city of New York. It is located 1 mile below the Olive Bridge post-office. The following deser *and discharge* data have been furnished by Mr. J. Waldo Smith, *engineer.*

The weir is constructed of concrete, having a cross section similar to that experimented on in the hydraulic laboratory at Cornell University by the United States Geological Survey, in Series 30, described in Water-Supply and Irrigation Paper No. 150.

The average height of this weir above the rock on which it is founded, for its entire length, is 7.54 feet; length between abutments, 193.90 feet. In order to form a channel of approach the abutments have been extended upstream at right angles with the axis of the weir for a distance of 16 feet, and the area of the channel of approach below the crest of the weir is 1,462 square feet. The abutments extend 14 feet above the level of the crest, and it is estimated that a flow of 40,000 cubic feet per second can be taken care of.

Measurements of the head on the weir are made in a well 24 inches in diameter, situated 53 feet upstream from the crest of the weir. Water is admitted to this well through a ¾-inch pipe extending 16 feet out into the stream in which, spaced 6 inches apart, are ¼-inch holes bored vertically through the pipe. The center of this pipe is placed 18 inches above the bed of the stream. A continuous record of the head at this point is kept by means of a Friez automatic water-stage register, geared 1 to 1 and running twenty-four hours. Observations of the flow were first begun on October 17, 1906, though the automatic gage register was not installed until December 5. Prior to this latter date heads were read three times daily and reduced in the usual manner.

Computations of the discharge over this weir are made from a formula which has been deduced from the results of the experiments made by the United States Geological Survey and referred to above. During the winter the ice which forms between the wing walls which form the channel of approach is kept cut away so that there may be no change in the conditions of flow due to this cause.

The watershed of Esopus Creek above the weir is 239 square miles, as measured on the topographic maps of the United States Geological Survey.

Daily discharge, in second-feet, of Esopus Creek near Olive Bridge, N. Y., [illegible]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1		196	295	17		1,155	[illegible]
2		176	280	18		1,397	258
3		155	277	19	12	1,207	242
4		142	331	20	655	916	284
5		133	311	21	139	910	335
6		121	458	22	105	972	476
7		103	507	23	102	851	373
8		98	216	24	77	760	209
9		73	314	25	1,130	676	248
10		57	368	26	630	565	276
11		62	396	27	534	472	289
12		91	331	28	420	410	291
13		144	320	29	323	356	283
14		137	306	30	268	304	319
15		392	370	31	226	.....	2,004
16		655	417				

Monthly discharge of Esopus Creek near Olive Bridge, N. Y., for 1906.

[Drainage area, [illegible] square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
[illegible]	[illegible]	62	386	1.62	[illegible]
[illegible]	[illegible]	57	455	1.90	[illegible]
[illegible]	[illegible]	209	390	1.63	[illegible]

WAPPINGER CREEK NEAR WAPPINGER FALLS, N. Y.

This station was established May 19, 1903, at the first highway bridge crossing Wappinger Creek above the village of Wappinger Falls. It was discontinued July 1, 1905, but the rating tables and estimates of monthly discharge heretofore unpublished are given in the following tables. The conditions at the station and the bench marks are described in Water-Supply Paper No. 166, page 55, where are given also references to publications that contain data for previous years.

Rating tables for Wappinger Creek, near Wappinger Falls, N. Y.

MAY 19, 1903, TO AUGUST 31, 1903.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.30	30	1.50	260	2.70	629	3.90	1,098
0.40	40	1.60	286	2.80	665	4.00	1,140
0.50	52	1.70	313	2.90	702	4.20	1,226
0.60	66	1.80	341	3.00	740	4.40	1,315
0.70	82	1.90	370	3.10	778	4.60	1,407
0.80	100	2.00	400	3.20	816	4.80	1,502
0.90	120	2.10	430	3.30	855	5.00	1,600
1.00	142	2.20	461	3.40	894	5.20	1,700
1.10	165	2.30	493	3.50	934	5.40	1,802
1.20	188	2.40	526	3.60	974	5.60	1,906
1.30	211	2.50	560	3.70	1,015	5.70	1,959
1.40	235	2.60	594	3.80	1,056		

[a] This table is based on 6 discharge measurements made during 1903 and is well defined between gage heights 0.6 foot and 5.0 feet.

SEPTEMBER 1, 1903, TO JUNE 30, 1905.[b]

0.30	10	1.00	181	2.30	537	4.20	1,287
0.20	16	1.10	202	2.40	571	4.40	1,375
0.10	23	1.20	224	2.50	606	4.60	1,465
0.00	31	1.30	247	2.60	641	4.80	1,557
0.10	40	1.40	271	2.70	677	5.00	1,650
0.20	51	1.50	296	2.80	714	5.20	1,744
0.30	63	1.60	323	2.90	752	5.40	1,840
0.40	76	1.70	351	3.00	790	5.60	1,937
0.50	90	1.80	380	3.20	868	5.80	2,035
0.60	105	1.90	410	3.40	948	6.00	2,135
0.70	122	2.00	441	3.60	1,030	7.00	2,644
0.80	141	2.10	472	3.80	1,114	8.00	3,174
0.90	161	2.20	504	4.00	1,200	9.00	3,724

[b] This table is applicable only for open-channel conditions. It is based on 5 discharge measurements made during 1903 to 1905 and on the form of the preceding curve. It is well defined between gage heights 0.15 foot and 3.0 feet.

thly discharge of Wappinger Creek near Wappinger Falls, N. Y., for 1903–1905.

[Drainage area, 194 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1903.					
to 31	200	35	75.9	0.391	0.19
	1,960	35	653	3.37	3.76
	836	91	267	1.38	1.59
	1,450	120	345	1.78	2.05
ber	771	122	276	1.42	1.58
r	3,040	114	633	3.26	3.76
ber	696	181	282	1.45	1.62
1904.					
8 to 31	3,500	284	977	5.04	4.50
	868	192	424	2.19	2.44
	771	151	248	1.28	1.48
	1,530	90	302	1.56	1.74
	501	70	129	.665	.77
	161	13	52.7	.272	.31
ber	790	23	167	.861	.96
r	771	93	209	1.08	1.24
ber	247	105	162	.835	.93
ber 1 to 7 and 28 to 31	1,380	181	560	2.89	1.18
1905.					
y	2,440	472	893	4.60	5.30
10 to 31	2,780	435	1,420	7.32	5.99
	908	181	468	2.41	2.69
	181	57	122	.629	.73
	87	31	59.1	.305	.34

:.—Ice conditions November 29 to December 31, 1903; January 1 to March 7 and December 8 to
l; February 1 to March 9, 1905.
es for 1903 are rated as follows: May and August, good; June, July, and September to November,
ent.
es for 1904 and 1905 are excellent.

DELAWARE AND HUDSON CANAL AT CREEKLOCKS, N. Y.

order to determine the run-off from the Rondout Creek drainage
n, gagings of the flow in the Delaware and Hudson Canal at the
of the Rosendale level were made from June, 1901, to December,
, inclusive, and were resumed in December, 1905. The diversion to
anal, added to the measured discharge of Rondout gaging station,
esents the total flow from the drainage basin. The observations
05 and 1906 were made in cooperation with the New York water
ly commission. The conditions at the station are described in
r-Supply Paper No. 166, page 57, where are given also references
blications that contain data for previous years.

Daily discharge in second-feet of Delaware and Hudson Canal at Creeklocks, N. Y., for 1.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	N
1	.....	21	22	.....	19	22	20	
2	.....	21	22	21	24	.....	19	
3	.....	22	.....	21	22	.....	22	
4	.....	20	23	21	23	21	19	....
5	.....	20	21	22	.....	25	20	
6	.....	.....	19	23	21	19	19	
7	.....	23	23	22	21	21	.....	
8	.....	21	21	.....	21	22	17	
9	14	20	23	21	20	.....	17	
10	13	21	.....	23	23	24	20	
11	8	20	23	22	22	22	19	....
12	12	22	22	24	.....	22	20	
13	11	.....	22	22	24	20	22	
14	11	23	22	23	21	20	.....	
15	.....	22	23	.....	23	20	28	
16	8	20	21	21	22	.....	20	
17	12	20	.....	23	22	19	21	
18	17	20	21	21	20	19	20	....
19	19	22	20	21	.....	17	18	
20	17	.....	22	22	22	22	20	
21	19	22	21	22	22	24	.....	
22	.....	20	23	.....	21	21	19	
23	18	20	21	23	23	.....	19	
24	17	19	.....	22	20	18	21	
25	17	20	22	21	22	18	16	....
26	17	21	23	23	.....	22	17	
27	16	.....	23	21	21	18	19	
28	17	21	22	20	20	23	.....	
29	.....	20	23	.....	22	20	17	
30	20	.....	23	22	21	.....	17	
31	.....	24	.....	21	19	.....	16	....

[a] Canal closed for season.

Monthly discharge of Delaware and Hudson Canal at Creeklocks, N. Y., for 1906.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Me
April (9-30)	20	8	
May	24	19	
June	23	19	
July	24	20	
August	24	19	
September	24	17	
October	28	16	
November	22	15	

NOTE.—Daily discharges interpolated on Sundays and other days when no flow was recorded.

RONDOUT CREEK AT ROSENDALE, N. Y.

This station was established July 6, 1901, at the highway bric at Rosendale, discontinued November 7, 1903, and reestablished December, 1905, in cooperation with the New York water-sup commission.

The flow in the Delaware and Hudson Canal at the Rosendale le must be added to that at the gaging station to obtain the total run from the drainage area above this point. The conditions at station are described in Water-Supply Paper No. 166, page 57, wh *are given also references* to publications that contain data for previ *years.*

The following discharge measurement was made August 23, 1906:

Width, 100 feet; area, 482 square feet; gage height, 6.50 feet; discharge, 261 second-feet.

Daily gage height, in feet, of Rondout Creek at Rosendale, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.08	6.87	7.23	9.05	6.97	6.95	7.20	6.67	6.42	7.00	.....	6.72
2	6.98	6.83	7.15	8.40	6.91	6.87	6.90	6.43	6.32	6.50	6.58	6.70
3	6.92	6.73	7.09	8.17	7.05	6.79	7.45	6.50	6.50	6.28	6.59	6.62
4	7.35	6.67	11.41	8.00	7.03	6.73	7.87	6.90	6.48	6.14	6.51	6.68
5	7.75	6.59	8.87	8.33	6.92	6.70	7.40	6.83	6.50	6.09	6.52	6.82
6	7.35	6.57	7.89	9.15	6.90	7.03	6.93	6.67	6.20	6.05	6.55	6.75
7	7.22	6.50	7.65	8.55	6.95	6.93	6.79	6.47	6.12	6.04	6.49	7.78
8	7.18	6.49	7.53	7.97	6.89	6.73	6.75	8.37	6.10	6.01	6.42	7.12
9	7.12	6.53	7.43	7.80	6.95	6.63	6.60	7.00	6.08	6.30	6.48	7.08
10	6.92	6.63	7.40	11.50	7.27	6.85	6.80	6.70	6.04	6.12	6.42	7.10
11	7.20	6.73	7.17	10.60	7.13	6.80	6.63	6.57	6.05	6.08	6.50	7.02
12	7.40	6.73	7.21	9.57	7.20	6.63	6.65	6.70	6.05	6.08	6.55	6.98
13	7.47	6.74	7.07	8.83	7.00	6.53	6.67	6.55	6.05	6.08	6.80	6.82
14	7.17	6.75	6.97	8.35	6.88	6.53	6.57	6.43	6.01	6.08	6.72	6.85
15	7.08	6.67	6.87	13.67	6.85	6.43	6.40	6.30	6.03	6.05	6.60	6.78
16	7.00	6.63	7.00	11.10	6.77	6.45	6.27	6.27	6.00	6.10	6.62	7.50
17	7.05	6.60	7.10	9.43	6.71	7.17	6.37	6.23	6.00	6.10	6.68	7.20
18	6.93	6.63	6.93	8.55	6.69	7.70	6.40	6.27	5.98	6.05	6.62	7.00
19	6.83	6.67	6.93	8.20	6.69	7.85	6.39	6.19	5.95	6.38	7.92	7.00
20	6.83	6.77	7.05	7.90	6.63	7.50	6.33	6.25	6.02	7.50	7.55	6.85
21	6.73	6.90	6.97	7.67	6.59	7.23	6.23	7.00	6.28	8.00	7.62	7.30
22	7.10	8.90	6.85	7.47	6.53	7.35	6.75	6.67	6.85	7.10	7.30	7.10
23	6.64	8.75	6.79	7.67	6.47	7.43	6.57	6.82	6.65	6.85	7.20	7.20
24	8.61	7.65	6.65	7.75	6.41	7.30	6.45	6.70	6.18	6.72	7.02	6.80
25	7.95	7.75	6.83	7.47	6.45	7.00	6.33	6.38	6.38	6.90	6.92	6.90
26	7.30	7.37	6.73	7.33	6.41	6.87	6.43	6.22	6.28	7.70	6.88	6.80
27	7.17	7.63	6.90	6.93	6.75	6.73	6.33	6.15	6.20	7.28	6.80	6.90
28	7.17	7.43	8.83	7.10	7.55	6.63	6.23	6.42	6.12	7.15	6.78	6.80
29	7.00	.....	8.73	7.03	8.07	6.63	6.23	6.38	6.12	6.95	6.70	6.75
30	6.87	.....	8.60	7.03	7.45	6.55	6.37	6.35	7.15	6.75	6.70	6.80
31	6.73	.....	9.78	.....	6.10	.....	6.73	6.52	.....	6.72	.....	7.20

NOTE.—Ice conditions from February 3 to noon February 22. Ice averaged about 0.5 foot in thickness. No report of ice after this date. December 6 river frozen over; ice went out 3 p. m. December 8. Ice averaged from 0.25 to 0.50 foot thick. During the frozen period the readings were taken to the water surface through a hole cut in the ice for January, February, and March, and to surface of ice for December with extra readings to water surface.

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice at gage.
	Feet.	*Feet.*	*Feet.*
December 19	6.85	7.0	0.12
December 22	7.1	7.2	.15
December 26	6.8	7.1	.25
December 29	6.75	7.2	.4

Rating table for Rondout Creek at Rosendale, N. Y., for 1901–1903 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
5.95	32	7.20	712	8.50	2,000	10.60	4,430
6.00	50	7.30	799	8.60	2,108	10.80	4,675
6.10	86	7.40	885	8.70	2,216	11.00	4,920
6.20	121	7.50	971	8.80	2,323	11.20	5,184
6.30	157	7.60	1,071	8.90	2,431	11.40	5,440
6.40	192	7.70	1,171	9.00	2,539	11.60	5,706
6.50	228	7.80	1,272	9.20	2,764	11.80	5,978
6.60	290	7.90	1,372	9.40	2,984	12.00	6,250
6.70	353	8.00	1,472	9.60	3,222	13.00	7,640
6.80	415	8.10	1,578	9.80	3,461	14.00	9,070
6.90	478	8.20	1,683	10.00	3,700		
7.00	540	8.30	1,789	10.20	3,943		
7.10	626	8.40	1,894	10.40	4,186		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1901–1906, and is well defined between gage heights 6.1 feet and 7.0 feet. Above 7.0 feet the rating is approximate.

Monthly discharge of Rondout Creek at Rosendale, N. Y., for 1906.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
January	2,120	316	[illegible]
March	5,490	322	1,[illegible]
April	8,600	497	2,[illegible]
May	1,550	86	[illegible]
June	1,320	203	[illegible]
July	1,340	132	[illegible]
August	1,860	103	[illegible]
September	669	32	[illegible]
October	1,470	64	[illegible]
November	1,390	199	[illegible]

NOTE.—Values for 1906 are fair.

MISCELLANEOUS MEASUREMENTS IN HUDSON RIVER DRAINAGE BASIN.

Miscellaneous discharge measurements in Hudson River drainage basin in 1904 and 1906.

Date.	Stream.	Locality.	Width.	Area of section.	Gage height.	Discharge.
1904.			*Feet.*	*Sq.-ft.*	*Feet.*	*Sec.-ft.*
July 30[a]	Hudson River	Corinth, N. Y.		1,220	126.16	2,[illegible]
August 25[a]	do	do		1,500	126.92	4,[illegible]
September 10[a]	do	do		1,150	126.03	2,[illegible]
September 26[a]	do	do		1,440	126.87	3,910
September 28[a]	do	do		1,500	126.95	4,[illegible]
October 2[a]	do	do		1,930	127.92	7,050
October 22[a]	do	do		3,050	130.45	17,970
1906.						
September 11[b]	Hudson River	do	507	994	125.9	1,670
September 12[b]	do	do	507	1,050	125.82	1,730
November 1[c]	do	do	488	1,650	126.12	2,560
August 19	Sacandaga River	Near Northville	52	81.4	.23	124
August 20	do	do	52	81.4	.20	123
August 23	Schoharie Creek	Middleburg, N. Y.			1.93	249
August 23	do	do			1.55	267
August 25	do	do			1.40	[d]106
September 7	do	do	90	140	1.30	70
September 7	do	do	90	141	1.28	74
August 24	do	First bridge below Schoharie Junction.			(e)	196
August 22	Fox Creek	Near junction Schoharie Creek.				57
August 23	do	do				59
August 25	do	do				46
April 3	Oriskany Creek	Walesville Upper Bridge.	60	213	[f]1.72	322
April 3	Small stream just below Walesville.		15.4	10.4		7.[illegible]

[a] Measured from boat above highway bridge.
[b] *Measured by boat above highway bridge.*
[c] *Measured from highway bridge.*
[d] *Meter thought to be out of order.*
[e] Water surface 27.6 feet below top of iron bar right-hand end of bridge, downstream side.
[f] Gage at Coleman.

PASSAIC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

c River rises in Somerset and Morris counties, N. J. Above uence with Pompton River, its main tributary, it meanders a flat country of Triassic red sandstone, to which in large must be attributed the turbidity of its waters. In contrast sluggish, muddy character of the Passaic, the Pompton is a ream, and its waters are clear. It drains parts of Sussex, Morris, and other adjoining counties, and traverses for a large ts course a country of hard crystalline rocks and heavy forests, ral level of which is several hundred feet above that of the At their confluence the Pompton enters with a current rries it well toward the right bank of the Passaic, and at times causes much backwater in the latter.

ighest recorded flood which has occurred in this drainage basin of October, 1903. The flood began at 6.30 p. m. October 8 ed until midnight October 18, the maximum height being at 9 p. m. October 10. There was a total rainfall of 11.74 etween October 8 and 11. The estimated maximum discharge Dundee dam was 35,800 second-feet. This flood is fully d in Water-Supply Paper No. 92.

PASSAIC RIVER AT MILLINGTON, N. J.

tation was established November 25, 1903, and was discontin- y 15, 1906. It is located at the lower highway bridge at on, N. J. The conditions at the bench marks are described in Supply Paper No. 167, page 59, where are given also references cations that contain data for previous years.

arge measurements of Passaic River at Millington, N. J., for 1903 to 1906.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec. ft.*
0...	F. H. Tillinghast	.....	71	1.80	78
8[a]	.....do	.....	109	2.50	66
....	F. H. Tillinghast	65	90	2.12	133
....	F. H. Brundage	57	37	1.36	38
.....	John C. Hoyt	63	63	1.65	75
.....	.....do	55	27	1.20	21
0....	H. D. Comstock	62	44	1.42	38
.....	R. H. Bolster	54	24	1.12	12.8
.....	Robert Follansbee	63	65	1.82	83

[a] Measurement affected by ice jams below the gaging section.

Daily gage height, in feet, of Passaic River at Millington, N. J., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Ju
1	1.95	1.58	2.20	3.00	1.60	2.15	
2	1.65	1.58	1.80	2.65	1.65	1.85	
3	1.58	2.05	2.25	2.45	1.70	1.65	
4	3.15	1.68	5.80	2.05	1.70	1.50	
5	3.20	1.52	5.15	1.95	1.60	1.42	
6	2.80	1.60	4.72	2.00	1.60	1.40	
7	2.38	1.52	3.45	1.90	1.65	1.32	
8	2.25	1.55	2.60	1.80	1.68	1.30	
9	1.85	1.70	2.90	1.85	1.68	1.30	
10	2.10	1.70	2.70	4.90	1.70	1.30	
11	1.98	1.70	2.60	4.95	1.62	1.30	
12	1.62	1.70	2.45	4.00	1.55	1.28	
13	1.88	1.70	2.40	3.10	1.55	1.22	
14	1.82	1.78	2.25	2.45	1.55	1.15	
15	1.95	1.88	2.10	3.85	1.52	1.15	
16	2.30	1.82	2.15	4.20	1.50	1.30	....
17	2.45	1.68	2.55	3.55	1.50	1.45	....
18	2.28	1.75	2.50	2.75	1.48	1.50	....
19	2.10	1.72	2.15	2.40	1.40	1.78	....
20	1.95	1.70	2.20	2.20	1.38	1.68	....
21	1.95	1.98	2.35	2.05	1.32	1.55	....
22	2.00	3.72	2.10	1.95	1.30	1.55	....
23	2.00	3.10	2.05	2.05	1.30	1.42	....
24	1.90	2.68	1.75	.....	1.30	1.48	....
25	1.82	2.35	1.60	.....	1.30	1.38	....
26	1.72	2.55	1.65	.....	1.30	1.25	....
27	1.62	2.22	1.95	.....	1.38	1.22	....
28	1.68	1.92	3.20	.....	2.00	1.20	....
29	1.72	.....	3.90	1.65	2.90	1.30	....
30	1.58	.....	3.55	1.65	2.68	1.32	....
31	1.55	.....	3.45	.....	2.42	.....	....

NOTE.—River frozen February 2 to 21.

Rating table for Passaic River at Millington, N. J., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	7	2.10	128	3.30	398	5.00	935
1.00	10	2.20	146	3.40	424	5.20	1,005
1.10	14	2.30	164	3.50	452	5.40	1,075
1.20	20	2.40	184	3.60	480	5.60	1,145
1.30	28	2.50	204	3.70	510	5.80	1,215
1.40	37	2.60	226	3.80	540	6.00	1,285
1.50	47	2.70	248	3.90	570	6.20	1,360
1.60	58	2.80	272	4.00	600	6.40	1,440
1.70	70	2.90	296	4.20	664	6.60	1,520
1.80	82	3.00	320	4.40	728	6.80	1,600
1.90	96	3.10	346	4.60	795	7.00	1,680
2.00	112	3.20	372	4.80	865	7.20	1,760

NOTE.—The above table is applicable only for open-channel conditions. It is based on 8 discha measurements made during 1903-1906 and is well defined between gage heights 1.0 feet and 2.5 f The extension of this rating is only approximate at gage height, 7.3 feet.

Monthly discharge of Passaic River at Millington, N. J., for 1903 to 1906.

[Drainage area, 57 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-feet per sq. mile.	Depth in inches.
1903.[a]					
25 to 30	80	56	65.3	1.15	0.26
[b]	858	26	130	2.28	2.63
1904.[c]					
			80	1.40	1.61
[f]			100	1.75	1.89
	[g] 1,750		277	4.86	5.60
	600	39	152	2.67	2.98
	194	17	58.1	1.02	1.18
	104	12	37.2	.653	.73
	72	11	23.7	.416	.48
	260	24	102	1.79	2.06
[f]	907	14	155	2.72	3.03
	616	20	106	1.86	2.14
	194	35	67.1	1.18	1.32
[d]			50	.877	1.01
year	1,750	11	101	1.77	24.03
1905.[e]					
			130	2.28	2.63
[f]			30	.526	.55
	[g] 1,180		330	5.79	6.68
	296	47	107	1.88	2.10
	60	24	35.2	.618	.71
	56	14	24.3	.426	.48
	52	8	15.8	.277	.32
	180	12	39.1	.686	.79
[f]	367	17	133	2.33	2.60
	150	19	40.9	.718	.83
[f]	341	17	36.0	.632	.71
[f]	346	35	138	2.42	2.79
year	1,180	8	88.3	1.55	21.18
1906.[h]					
	372	52	125	2.19	2.52
[i]			75	1.32	1.38
			200	3.51	4.05
	917	64	251	4.40	4.91
	296	28	70.0	1.23	1.42
	137	17	41.6	.730	.81
15	155	20	54.7	.960	.54

s for 1903 are rated as follows: November, good; December, fair.
onditions. Mean discharge determined partly from the flow of North Branch of Raritan Pluckemin, N. J., during December, 1903.
s for 1904 are rated as follows: April to November, good; March, fair; January, February, ember, approximate.
onditions January 1 to March 8 and during parts of December. Estimates for the frozen re based on the flow at Pluckemin, N. J., and are considered conservative.
s for 1905 are rated as follows: April to December, good; January to March, approximate. zero was checked against the bench marks on June 21, 1905, and May 3, 1906. On the latter as found to be 0.14 in error, but no information is available to show when the error occurred. ently no corrections in gage heights were made for the latter part of 1905, and those estimates somewhat too high. Gage heights for 1906 were, however, corrected, which should give rea close estimates. The estimates of accuracy have been made on the assumption that no error n the gage heights.
onditions January 1 to March 17; estimates based on flow at Pluckemin, N. J. channel.
s for 1906 are rated as follows: April to July, good (see footnote 1905); January, fair; Febru- March, approximate.
onditions during February and probably backwater during March, owing to ice lodged at w the gaging section. Estimates based on estimates at Pluckemin and at Chatham, N. J. arge interpolated April 21 to 28.
—Flow at the Pluckemin station is probably only affected by a smooth ice cover during periods. North Branch of Raritan is a deep, sluggish stream at the Pluckemin station. llington section, on the other hand, is shallow and rocky and collects much ice drift, tly causing backwater at the gaging section, thus rendering the daily gage heights of little s an index of the discharge. Knowing the ice thickness at Pluckemin it has been possible to good estimates at that point for ice periods. A coefficient based on the relative flow at Mill- and Pluckemin was used to find flow at the former.

The following table gives the horsepower, 80 per cent efficienc per foot of fall that may be developed at different rates of dischar and shows the number of days on which the flow and the correspon ing horsepower were respectively less than the amounts given in t columns for "discharge" and "horsepower."

Discharge and horsepower table for Passaic River at Millington, N. J.

Discharge in second-feet.	H. P. per foot fall; 80 per cent efficiency.	Number of days of deficient flow.			
		1903.a	1904.	1905.	1906.b
11	1	.....	.....	5	.....
22	2	.....	49	80	4
33	3	1	87	182	43
44	4	4	128	211	57
55	5	9	195	240	71

a November 25 to December 31, 1903. b January 1 to July 15, 1906.

PASSAIC RIVER NEAR CHATHAM, N. J.

This station was established February 10, 1903, by the United Sta Weather Bureau, by which it is maintained. It is located at second bridge, about 1.5 miles upstream from Chatham, N. J. T conditions and the bench marks are described in Water-Supply Pa No. 167, page 61, where are given also references to publications t contain data for previous years.

The following discharge measurement was made May 3, 1906:

Width, 65 feet; area, 95 square feet; gage height, 2.74 feet; discharge, 106 second-f

Daily gage height, in feet, of Passaic River, near Chatham, N. J., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	I
1	3.3	2.6	2.6	4.2	2.7	3.2	3.1	3.7	2.3	2.2	2.8	
2	3.2	2.5	2.6	3.8	2.6	3.0	2.8	3.4	2.2	2.2	2.7	
3	3.2	.....	2.7	3.5	2.7	2.9	2.5	3.6	2.2	2.2	2.6	
4	4.1	.....	4.9	3.4	2.6	2.8	3.0	3.7	2.2	2.1	2.6	..
5	4.0	.....	4.9	3.2	2.6	2.7	3.8	3.6	2.2	2.2	2.5	..
6	3.9	.....	4.5	3.2	2.6	2.6	3.6	3.4	2.2	2.3	2.5	..
7	3.5	.....	4.2	3.1	2.8	2.5	3.3	3.0	2.1	2.3	2.4	
8	3.3	.....	4.0	2.9	2.7	2.5	2.9	3.3	2.1	2.3	2.4	..
9	3.8	.....	3.6	2.8	2.7	2.4	2.5	3.2	2.1	2.2	2.3	..
10	3.5	.....	3.3	5.0	2.8	2.4	2.3	3.0	2.1	2.2	2.3	..
11	3.3	.....	3.2	4.8	2.7	2.4	2.4	2.9	2.1	2.2	2.3	
12	3.0	.....	3.1	4.7	2.7	2.3	2.3	3.3	2.1	2.1	2.5	
13	3.1	.....	3.0	4.5	2.7	2.3	2.2	3.2	2.1	2.1	2.5	
14	3.1	.....	2.8	4.4	2.8	2.3	2.2	3.0	2.1	2.1	2.4	
15	3.2	.....	2.7	5.0	2.7	2.2	2.2	2.9	2.0	2.1	2.3	
16	3.3	.....	2.9	5.3	2.7	2.2	2.1	2.8	2.0	2.1	2.6	
17	3.6	.....	2.8	4.5	2.6	2.4	2.1	2.7	2.0	2.0	2.5	
18	3.4	.....	2.8	4.4	2.6	2.5	2.8	2.7	2.0	2.0	2.5	
19	3.3	.....	2.7	3.9	2.6	2.7	2.7	2.7	2.0	2.0	3.2	..
20	3.1	.....	2.7	3.5	2.5	3.1	2.5	2.6	2.0	2.0	3.2	..
21	3.0	.....	2.6	3.2	2.5	2.9	2.3	2.5	2.0	2.3	3.1	
22	3.0	3.6	2.6	3.0	2.5	2.8	2.7	2.5	2.0	2.7	3.0	
33	2.9	4.3	2.6	2.8	2.4	2.7	2.9	2.4	2.1	2.8	2.9	..
24	3.0	4.0	2.5	3.4	2.4	2.8	2.8	2.4	2.1	3.0	2.8	..
25	3.0	3.4	2.5	3.3	2.4	2.7	2.7	2.4	2.0	3.0	2.7	..
26	2.9	3.3	2.8	3.2	2.4	2.6	2.6	2.3	2.0	2.9	2.6	..
27	2.9	3.0	3.2	3.0	2.3	2.5	2.5	2.4	2.0	2.8	2.5	..
28	2.8	2.7	4.0	2.9	2.7	2.4	2.4	2.5	2.1	2.7	2.5	..
29	2.7	.....	4.6	2.8	4.0	3.4	3.9	2.4	2.1	2.7	2.4	..
30	2.7	.....	4.5	2.8	3.8	3.3	4.2	2.3	2.2	2.6	2.3	..
31	2.6	.....	4.4	.....	3.5	.....	4.0	2.3	.....	2.6	.....	..

NOTE.—*Ice conditions January 9 to 16, February 3 to 22, February 28 to March 2, March 19 to December 4 to 6, 8 to 10, 19 to 20, and 23 to 31.*

Rating table for Passaic River, near Chatham, N. J., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	2	2.90	124	3.70	391	4.50	758
2.10	4	3.00	149	3.80	433	4.60	809
2.20	9	3.10	176	3.90	476	4.70	861
2.30	17	3.20	206	4.00	520	4.80	914
2.40	29	3.30	239	4.10	565	4.90	968
2.50	44	3.40	274	4.20	611	5.00	1,022
2.60	61	3.50	312	4.30	659	5.20	1,132
2.70	80	3.60	351	4.40	708	5.40	1,245
2.80	101						

NOTE.—The above table is applicable only for open-channel conditions. It is based on 14 discharge measurements made during 1903 to 1905, and is well defined between gage heights 2.28 feet and 3.8 feet. At gage heights 2.0 and 2.1 feet the rating is approximate.

Monthly discharge of Passaic River near Chatham, N. J., for 1906.

[Drainage area, 101 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January[a]	[b]565	[b]61	203	2.01	2.32
February[a]	[b]659	.....	122	1.21	1.26
March[a]	[b]968	.....	293	2.90	3.34
April	1,190	101	427	4.23	4.72
May	520	17	98.7	.977	1.13
June	274	9	80.9	.801	.89
July	611	4	133	1.32	1.52
August	391	17	140	1.39	1.60
September	17	2	4.7	.047	.05
October	149	2	34.7	.344	.40
November	206	17	67.3	.666	.74
December[a]	[b]520	[b]9	85.3	.845	.97
The year	1,190	2	141	1.40	18.94

[a] Ice conditions during January, February, March, and December. Daily flow during frozen periods determined largely by the flow of North Branch of Raritan River at Pluckemin, N. J. The section at the latter point is deep, and the flow during ice periods is probably only affected by a smooth ice cover. The Chatham section is shallow, and at times the collection of ice below the gage causes backwater.

[b] Open channel.

NOTE.—Values are rated as follows: April to August, October and November, good; January to March, September and December, approximate.

RAMAPO RIVER NEAR MAHWAH, N. J.

This station was established February 10, 1903, by the United States Weather Bureau, by which it is maintained. It is located at a concrete-arch highway bridge about 1 mile west of Mahwah, N. J. The conditions and the bench marks are described in Water-Supply Paper No. 167, page 64, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of Ramapo River, near Mahwah, N. J., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1	4.0	3.7	.....	5.1	3.6	4.6	3.0	3.5	3.0	2.8	3.0	[illegible]
2	3.9	3.6	3.9	4.8	3.8	4.3	2.9	3.4	2.9	2.7	2.9	[illegible]
3	3.7	3.6	3.8	4.6	3.8	4.0	2.9	4.0	2.8	2.7	2.8	[illegible]
4	3.7	3.4	6.9	4.5	3.8	3.8	4.6	4.5	2.9	2.6	2.8	[illegible]
5	4.6	3.3	6.1	4.4	3.8	3.7	4.1	4.1	2.9	2.6	2.8	[illegible]
6	4.4	.....	5.0	4.3	3.7	3.6	3.7	3.8	2.8	2.6	2.8	[illegible]
7	4.2	.....	4.8	4.3	3.8	3.8	3.5	3.6	2.8	2.6	2.8	[illegible]
8	4.0	.....	4.6	4.2	3.8	3.6	3.4	3.8	2.8	2.7	2.8	[illegible]
9	4.0	.....	4.5	4.2	3.8	3.5	3.3	3.7	2.8	2.6	2.7	.....
10	3.7	.....	4.4	6.4	4.0	3.6	3.2	3.4	2.7	2.7	2.7	.....
11	3.6	.....	4.3	6.1	3.9	3.5	3.1	3.3	2.7	2.8	2.7	[illegible]
12	3.5	.....	4.1	5.3	3.9	3.3	3.0	3.3	2.7	2.7	3.1	.....
13	4.0	.....	4.0	4.9	3.8	3.2	3.0	3.2	2.8	2.7	3.0	.....
14	4.0	3.4	3.9	4.7	3.6	3.2	3.0	3.1	2.7	2.6	2.9	[illegible]
15	4.0	3.4	3.8	5.1	4.0	3.2	2.9	3.1	2.8	2.6	2.9	[illegible]
16	4.0	.....	3.6	5.6	3.8	3.1	2.9	2.9	2.7	2.6	3.0	[illegible]
17	3.9	.....	3.9	5.3	3.6	3.6	2.9	2.9	2.7	2.6	3.0	[illegible]
18	3.9	3.3	3.7	4.9	3.6	3.5	3.0	2.8	2.6	2.6	3.0	[illegible]
19	4.0	3.3	3.6	4.6	3.6	3.7	2.9	2.8	2.6	2.7	3.6	[illegible]
20	4.0	3.3	3.7	4.5	3.5	3.5	2.8	2.8	2.6	2.7	4.0	.....
21	3.9	3.5	3.7	4.4	3.4	3.5	2.8	2.9	2.9	3.8	3.8	[illegible]
22	3.9	5.1	3.7	4.3	3.4	3.4	3.2	2.9	2.8	3.5	3.7	[illegible]
23	3.9	4.9	3.7	4.3	3.4	3.3	4.1	2.9	3.6	3.3	3.5	[illegible]
24	4.1	4.4	3.6	4.4	3.3	3.3	4.0	3.2	3.1	3.1	3.4	....
25	4.1	4.2	3.5	4.4	3.3	3.3	3.7	3.4	2.9	3.3	3.3	....
26	4.0	4.8	3.6	4.2	3.2	3.2	3.3	3.2	2.8	3.6	3.2	....
27	3.9	4.4	3.7	4.0	3.2	3.2	3.2	3.1	2.8	3.4	3.2	....
28	3.8	4.1	5.3	3.9	5.0	3.2	3.1	3.6	2.8	3.2	3.1	....
29	3.8	.....	5.4	3.7	6.2	3.1	3.0	3.3	2.8	3.1	3.1	[illegible]
30	3.8	.....	5.2	3.7	5.7	3.0	3.6	3.2	2.8	3.1	3.0	[illegible]
31	3.7	.....	5.2	.....	5.0	.....	4.1	3.1	.....	3.1	.....	[illegible]

NOTE.—River frozen January 10 to 15, February 6 to 19, March 1 and 2, December 8 to 13, 19 to 2[illegible] and 24 to 29.

Rating table for Ramapo River near Mahwah, N. J., for 1905 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.60	24	3.60	167	4.60	546	5.60	1,075
2.70	30	3.70	194	4.70	593	5.70	1,133
2.80	37	3.80	224	4.80	641	5.80	1,191
2.90	46	3.90	257	4.90	691	5.90	1,250
3.00	56	4.00	293	5.00	743	6.00	1,310
3.10	68	4.10	331	5.10	796	6.20	1,433
3.20	82	4.20	371	5.20	850	6.40	1,560
3.30	99	4.30	413	5.30	905	6.60	1,690
3.40	119	4.40	456	5.40	961	6.80	1,820
3.50	142	4.50	500	5.50	1,018	7.00	1,950

NOTE.—The above table is applicable only for open-channel conditions. It is based on 6 discharg[illegible] measurements made during 1904 to 1905, and is well defined between gage heights 2.65 feet and 6.[illegible] feet.

Monthly discharge of Ramapo River near Mahwah, N. J., for 1906.

[Drainage area, 118 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	546	.....	275	2.33	2.69
February	796	.....	209	1.77	1.84
March	1,880	142	454	3.85	4.44
April	1,560	194	588	4.98	5.56
May	1,430	82	292	2.47	2.85
June	546	56	156	1.32	1.47
July	546	37	126	1.07	1.23
August	500	37	124	1.05	1.21
September	167	24	41.8	.354	.40
October	224	24	56.7	.481	.55
November	293	30	79.7	.675	.75
December	331	56	103	.873	1.01
The year	1,880	24	209	1.77	24.00

NOTE.—Values are rated as follows: March to November, excellent; January, good; February and December, fair. Since this station has not been visited since June, 1905, the above estimates of accuracy are dependent on the constancy of conditions of flow at the station since that time. Discharge during ice periods estimated.

RARITAN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Raritan River, the largest stream in New Jersey except the Delaware, is formed by two chief branches, North and South, which have their sources a few miles apart in the highlands of Morris County, flow southward, and unite near Somerville, from which point the course of the river is southeastward to Raritan Bay. The river is tidal to a point about 2 miles above New Brunswick, and is navigable to that city, about 12 miles from the mouth.

The total area of the drainage basin is 1,105 square miles, about 10 per cent of which is forested. The highlands consist mostly of trap rock and contain a large proportion of the wooded areas of the basin. The area outside of the highlands consists either of trap rock or red sandstone. Of the 800 square miles of drainage area above the gaging station at Boundbrook, about 150 square miles are in the cultivated part of the highlands and on the trap ridges; the remainder is mostly on the low, level, red-sandstone plain.

The valley of the Raritan is populous and highly cultivated, and a large amount of water power is utilized on its various branches. North Branch is considered a valuable source for a gravity supply, the elevation of the upper portion ranging from 750 to 1,100 feet. Millstone River, an important stream which unites with the Raritan a few miles west of Boundbrook, differs from the other branches, having its rise in sand hills and flowing northwestward through a sandy soil. It has large ground storage, and is better suited for power than for water supply, being very muddy at high stages.

SOUTH BRANCH RARITAN RIVER AT STANTON, N. J.

This station was established July 2, 1903, at the highway bridg about 500 feet from the Lehigh Valley Railroad station at Stanton N. J. The conditions and the bench marks are described in Water Supply Paper No. 167, page 68, where are given also references t publications that contain data for previous years.

The following discharge measurement was made May 4, 1906:

Width, 98 feet; area, 173 square feet; gage height, 2.94 feet; discharge, 219 second feet.

Daily gage height, in feet, of South Branch Raritan River at Stanton, N. J., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1	3.31	3.02	3.01	3.18	2.92	2.91	3.08	3.46	2.39	2.11	2.46	2.
2	3.39	3.00	3.04	3.15	2.91	2.81	3.09	3.48	2.36	2.16	2.49	2.
3	3.30	3.02	5.45	3.21	2.96	2.90	2.88	3.24	2.31	2.21	2.54	2.
4	3.29	3.11	5.56	3.19	2.84	2.82	2.80	2.88	2.30	2.29	2.39	2.
5	3.22	3.08	4.08	3.22	2.81	2.79	2.80	2.79	2.25	2.29	2.59	2.
6	3.14	3.02	3.56	3.21	2.81	2.79	2.76	2.64	2.24	2.28	2.58	2.
7	3.04	3.05	3.40	3.16	2.82	2.80	2.76	2.68	2.26	2.34	2.54	2.
8	2.96	3.11	3.28	3.14	2.80	2.76	2.66	2.59	2.21	2.34	2.49	2.
9	2.96	2.99	3.21	3.08	2.79	2.71	2.68	2.51	2.21	2.26	2.52	2.
10	2.98	3.04	3.22	3.01	2.80	2.76	2.66	2.51	2.16	2.22	2.46	2.
11	3.18	2.90	3.20	3.00	2.81	2.68	2.61	2.52	2.18	2.24	2.96	2.
12	3.25	2.96	3.21	3.01	2.84	2.69	2.58	2.50	2.18	2.28	2.99	2.
13	3.08	2.91	3.19	2.95	2.92	2.56	2.56	2.55	2.16	2.24	2.81	2.
14	3.12	2.89	3.16	3.01	2.89	2.59	2.52	2.59	2.14	2.26	2.76	2.
15	3.11	2.82	3.16	4.61	2.82	2.45	2.42	2.61	2.19	2.12	2.68	2.
16	3.35	2.96	3.19	4.28	2.81	2.49	2.41	2.48	2.19	2.21	2.58	2.
17	3.09	3.15	3.14	3.74	2.80	2.44	2.40	2.56	2.16	2.32	2.48	2.
18	3.09	3.16	3.09	3.41	2.79	2.49	2.89	2.55	2.12	2.01	2.51	3.
19	3.11	3.41	3.12	3.36	2.75	2.49	2.61	2.41	2.16	2.18	2.50	3.
20	3.08	3.39	3.16	3.32	2.86	2.51	2.59	2.40	2.01	2.26	2.49	3.
21	3.05	3.45	3.19	3.30	2.86	2.50	2.59	2.41	2.01	2.56	2.44	3.
22	3.11	4.75	3.16	3.25	2.81	2.49	2.62	2.42	2.16	3.10	2.49	3.
23	3.08	3.61	3.20	3.16	2.81	2.45	2.59	2.49	2.41	2.82	2.48	3.
24	3.06	3.39	3.19	3.09	2.85	2.71	2.61	2.51	2.30	2.81	2.48	3.
25	3.00	3.55	3.09	3.11	2.86	4.00	2.54	2.44	2.22	2.69	2.51	3.
26	3.02	3.42	3.16	3.01	2.84	3.64	2.51	2.49	2.20	2.64	2.54	3.
27	3.11	3.18	3.52	2.98	3.31	3.01	2.59	2.59	2.25	2.61	2.52	3.
28	3.10	3.11	3.82	2.94	4.30	2.81	2.60	2.56	2.25	2.59	2.49	3.
29	3.18	.....	3.68	2.92	4.05	2.76	5.01	2.41	2.22	2.61	2.46	3.
30	3.09	.....	3.51	2.98	3.81	2.71	3.76	2.40	2.24	2.49	2.56	3.
31	2.98	.....	3.31	.....	3.56	.....	3.46	2.42	.....	2.52	.....	5.

NOTE.—Ice conditions February 8 to 19; also December 21 to 30; ice attaining a thickness of 0.3 fc during both periods.

Rating table for South Branch Raritan River at Stanton, N. J., for 1905 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	37	3.00	231	4.00	645	5.00	1,180
2.10	46	3.10	264	4.10	694	5.10	1,238
2.20	57	3.20	299	4.20	744	5.20	1,297
2.30	70	3.30	337	4.30	795	5.30	1,357
2.40	86	3.40	377	4.40	847	5.40	1,417
2.50	105	3.50	419	4.50	900	5.50	1,478
2.60	126	3.60	462	4.60	954	5.60	1,539
2.70	149	3.70	506	4.70	1,009		
2.80	174	3.80	551	4.80	1,065		
2.90	201	3.90	597	4.90	1,122		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 11 discha *measurements made during 1903 to 1906* and is well defined between gage heights 2.1 feet and 4.4 fe

Monthly discharge of South Branch Raritan River at Stanton, N. J., for 1906.

[Drainage area, 158 square miles.]

Month	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ary	373	219	274	1.73	1.99
uary	1,040	.....	288	1.82	1.90
h	1,510	234	410	2.59	2.99
l	960	207	323	2.04	2.28
.....	795	161	245	1.55	1.79
.....	645	94	174	1.10	1.23
.....	1,190	86	197	1.25	1.44
st	411	86	138	.873	1.01
mber	88	38	59.9	.379	.42
er	264	38	91.8	.581	.67
mber	228	84	119	.753	.84
mber	1,310	.....	238	1.51	1.74
The year	1,510	38	213	1.35	18.30

E.—Values are rated as follows: January and March to July, excellent; February and December, fair; August to November, good. Discharge during ice periods estimated.

NORTH BRANCH OF RARITAN RIVER NEAR PLUCKEMIN, N. J.

his station was established September 9, 1903, and was discon-ed July 15, 1906. It is located at the second bridge below Far , N. J., on the road to Somerville, about 2 miles from Far Hills. conditions and the bench marks are described in Water-Supply r No. 167, page 70, where are given also references to publica- that contain data for previous years.

arge measurements of North Branch of Raritan River near Pluckemin, N. J., for 1903 to 1906.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
903.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
nber 9	E. P. Roundey	.....	165	1.70	74
er 20	Wm. Nunn	.....	204	2.30	163
1904.					
2	F. H. Brundage	55	160	1.51	56
nber 9	H. D. Comstock	55	172	1.70	63
1905.					
21	R. M. Packard	55	146	1.25	24.6
h 16	F. H. Tillinghast	46	69	2.30	108
1906.					
3	Robert Follansbee	56	169	1.80	96

Daily gage height, in feet, of North Branch of Raritan River, near Pluckemin, N. J., 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Jul
1	2.00	1.75	1.85	2.35	1.80	1.90	[illegible]
2	1.90	1.80	1.80	2.05	1.80	1.82	[illegible]
3	3.40	2.00	2.25	1.98	1.85	1.78	[illegible]
4	3.00	1.90	2.95	1.90	1.72	1.72	[illegible]
5	2.00	1.85	2.48	1.90	1.60	1.68	[illegible]
6	2.00	2.00	2.38	1.90	1.70	1.60	[illegible]
7	2.00	2.00	2.28	1.90	1.78	1.62	[illegible]
8	2.00	2.00	2.08	1.90	1.70	1.50	[illegible]
9	2.00	2.15	2.00	2.15	1.70	1.45	[illegible]
10	2.00	2.05	1.90	3.68	1.62	1.40	[illegible]
11	2.00	2.10	1.90	2.75	1.58	1.40	[illegible]
12	2.20	2.20	1.90	2.60	1.52	1.35	[illegible]
13	2.20	2.10	1.90	2.60	1.50	1.30	[illegible]
14	2.20	1.82	1.90	2.60	1.50	1.30	[illegible]
15	2.10	1.75	1.80	3.60	1.50	1.30	[illegible]
16	2.25	1.78	1.88	2.70	1.50	2.20	.....
17	2.00	1.70	1.80	2.48	1.50	2.00	.....
18	2.00	1.70	1.75	2.38	1.50	2.65	.....
19	2.00	1.65	1.75	2.90	1.50	1.90	.....
20	1.90	1.60	1.68	2.45	1.45	1.90	.....
21	1.92	2.10	1.58	2.05	1.45	1.83	.....
22	2.00	2.50	1.50	1.90	1.40	1.82	.....
23	2.00	2.05	1.50	1.90	1.40	1.80	.....
24	2.00	1.90	1.50	1.90	1.42	1.72	.....
25	2.00	2.50	1.50	1.85	1.30	1.58	.....
26	1.95	2.15	1.55	1.82	1.30	1.50	.....
27	1.90	1.98	2.30	1.80	2.95	1.50	.....
28	1.90	1.90	2.80	1.80	3.00	1.50	.....
29	1.85	.....	2.70	1.80	2.35	1.80	.....
30	1.75	.....	2.50	1.88	2.05	1.70	.....
31	1.75	.....	2.55	.....	1.92	.....	.....

NOTE.—River frozen February 2 to 19.

Rating table for North Branch of Raritan River, near Pluckemin, N. J., for 1903 to 190

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.10	13	2.40	177	3.70	420	5.00	705
1.20	20	2.50	194	3.80	440	5.10	730
1.30	29	2.60	211	3.90	460	5.20	755
1.40	39	2.70	228	4.00	480	5.30	780
1.50	50	2.80	246	4.10	500	5.40	805
1.60	62	2.90	264	4.20	520	5.50	830
1.70	74	3.00	282	4.30	540	5.60	855
1.80	87	3.10	301	4.40	560	5.70	880
1.90	101	3.20	320	4.50	580	5.80	905
2.00	115	3.30	340	4.60	605	5.90	930
2.10	130	3.40	360	4.70	630	6.00	960
2.20	145	3.50	380	4.80	655	6.20	1,020
2.30	161	3.60	400	4.90	680	6.40	1,080

NOTE.—The above table is applicable only for open-channel conditions. It is based on 6 dischar measurements made during 1903–1906 and is fairly well defined between gage heights 1.2 feet and feet. The above rating is approximate at gage height 6.4 feet.

'ischarge of North Branch of Raritan River, near Pluckemin, N. J., for 1903 to 1906.

[Drainage area, 52 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1903.[a]					
to 30.	320	50	102	1.96	1.60
	1,110	48	180	3.46	3.99
	115	[c] 70	82.6	1.59	1.77
	[d] 540	[c] 50	129	2.48	2.86
1904.[e]					
	[d] 1,030	[c] 50	137	2.63	3.03
	[d] 1,000	[c] 70	178	3.42	3.69
	767	87	157	3.02	3.48
	255	74	116	2.23	2.49
	174	29	68.7	1.32	1.52
	168	20	65.5	1.26	1.41
	246	29	65.6	1.26	1.45
	560	39	109	2.10	2.42
	.....	39	175	3.37	3.76
	592	50	112	2.15	2.48
	273	74	151	2.90	3.24
	[c] 120	[c] 30	56.1	1.08	1.24
ar	1,030	20	116	2.23	30.21
1905.[h]					
	[d] 680	[c] 60	151	2.90	3.34
	[c] 70	[c] 20	36.4	.700	.73
	[d] 460	[c] 20	190	3.65	4.21
	211	56	112	2.15	2.40
	74	24	44.8	.862	.99
	74	16	33.1	.637	.71
	237	13	46.6	.896	1.03
	310	20	62.5	1.20	1.38
	400	62	164	3.15	3.51
	145	44	68.1	1.31	1.51
	500	39	74.5	1.43	1.60
	400	50	139	2.67	3.08
ar	680	13	93.5	1.80	24.49
1906.[j]					
	360	80	128	2.46	2.84
	[d] 194	[c] 40	79.4	1.53	1.59
	273	50	120	2.31	2.66
	416	87	158	3.04	3.39
	282	29	79.2	1.52	1.75
	219	29	74.8	1.44	1.61
	145	20	48.3	.929	.52

r 1903 are rated as follows: September, excellent; October and November, good Decem-

tions November 30 to December 12, December 17 to 19 and 27 to 31. Daily discharge
om observer's notes on ice thickness.
tions; values approximate.
nnel.
r 1904 are rated as follows: March to November, good: January, February, and Decem-
mate.
tions January 1 to March 1 and December 7-31. Daily flow during ice period determined
er's notes on ice thickness.
shed away September 14. Discharge September 15 to 17 estimated 700 second-feet on
at other stations in Raritan River drainage basin, and Passaic River drainage basin.
or 1905 are rated as follows: April to December, good; March, fair; January and Febru-
mate.
tions January 1 to 6, 15 to 18, and January 22 to March 10. Daily flow during ice period
observer's notes on ice thickness.
r 1906 are rated as follows: January and March to July, good; February, approximate.
zen February 2 to 19. Daily discharge estimated from observer's notes on ice thickness.

llowing table gives the horsepower, 80 per cent efficiency, per
'all that may be developed at different rates of discharge and
ie number of days on which the flow and the corresponding
ver were, respectively, less than the amounts given in the
for "discharge" and "horsepower."

Discharge and horsepower table for North Branch Raritan River near Pluckemin, N.

Discharge in second-feet.	H. P. per foot fall; 80 per cent efficiency.	Number of days of deficient flow.			
		1903.[a]	1904.	1905.	1906.[b]
22	2	.....	1	36	2
33	3	.....	20	79	10
44	4	.....	58	110	21
55	5	14	108	173	50

[a] September 9 to December 31, 1903.
[b] January 1 to July 15, 1906.

RARITAN RIVER AT FINDERNE, N. J.

This station was established June 27, 1903. It is located at the hi way bridge one-fourth mile from the Central Railroad of New Jer station at Finderne, N. J. The conditions and the bench marks described in Water-Supply Paper No. 167, page 71, where are giv also references to publications that contain data for previous years

The following discharge measurement was made May 2, 1906:

Width, 166 feet; area, 231 square feet; gage height, 4.27 feet; discharge, 563 seco feet.

Daily gage height, in feet, of Raritan River at Finderne, N. J., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	4.45	4.22	4.32	5.25	4.18	4.35	4.22	4.12	3.78	3.68	4.22	
2	4.22	4.02	4.60	4.82	4.30	4.28	3.88	4.35	3.72	3.62	4.05	
3	4.25	4.38	6.52	4.72	4.28	4.18	3.85	4.68	3.98	3.58	3.92	
4	4.18	4.42	11.65	4.62	4.18	4.08	8.00	5.20	3.68	3.58	3.92	
5	8.80	4.40	6.02	4.50	4.15	4.00	5.72	4.45	3.68	7.50	3.96	
6	5.72	4.15	5.15	4.52	4.08	3.90	4.38	4.30	3.62	4.60	3.82	
7	5.25	4.30	5.02	4.52	4.15	3.85	4.25	4.18	3.62	4.50	3.78	
8	4.42	3.90	4.88	4.32	4.18	3.90	3.63	4.30	3.60	3.72	3.72	
9	4.55	4.20	4.75	4.30	4.02	3.88	4.25	4.50	3.58	3.68	3.72	
10	5.52	4.12	4.72	10.48	4.28	3.80	3.92	3.92	4.48	3.72	3.78	
11	5.70	4.42	4.45	7.30	4.02	3.82	4.35	3.88	3.52	3.72	4.40	
12	5.85	4.15	4.40	5.78	4.02	3.78	4.18	3.85	3.48	3.62	3.92	
13	4.65	4.02	4.45	5.15	3.98	3.80	3.88	3.80	3.52	3.58	3.88	
14	4.92	4.10	4.28	4.82	3.88	3.68	3.78	3.72	3.50	3.62	3.82	
15	4.48	4.58	4.20	7.88	4.02	3.62	3.82	3.70	3.52	3.58	3.78	
16	5.12	4.58	4.38	6.18	3.88	3.78	3.98	3.62	3.50	3.58	3.88	
17	5.15	4.20	4.40	5.28	3.88	4.25	4.12	3.62	3.48	3.55	4.35	
18	4.70	4.08	4.35	5.00	4.08	4.52	4.25	3.60	3.50	3.60	4.28	
19	4.48	4.08	4.38	4.90	4.00	4.95	3.82	3.62	3.50	3.68	5.25	
20	4.55	4.48	4.22	4.60	3.85	4.48	4.10	3.65	3.48	4.28	4.48	
21	4.42	4.62	4.25	4.58	3.88	4.15	4.05	3.62	3.50	4.42	4.25	
22	4.62	7.85	4.35	4.58	3.78	4.35	4.05	3.68	3.50	4.72	4.22	
23	4.48	4.90	4.10	4.58	3.75	4.22	3.98	4.35	4.18	4.50	4.12	
24	4.62	4.58	3.98	4.75	3.75	4.12	3.90	3.85	3.72	4.58	4.30	
25	4.40	4.70	4.08	4.58	3.72	3.98	3.72	3.70	3.62	4.22	3.98	
26	4.60	5.18	4.15	4.38	3.72	3.98	3.68	3.78	3.60	4.00	3.98	
27	4.40	5.05	5.05	4.30	4.80	3.88	3.62	3.72	3.52	3.98	4.25	
28	4.52	4.58	8.10	4.32	6.98	3.92	3.62	3.75	3.52	3.92	3.98	
29	4.30	.....	6.40	4.12	5.80	3.92	4.95	3.82	3.50	3.98	4.25	
30	4.18	.....	5.68	4.20	4.82	4.18	5.62	3.78	3.52	3.88	3.80	
31	4.15	.....	5.95	.....	4.55	.....	4.42	3.80	.....	4.58	.....	

NOTE.—No ice notes by observer; flow assumed to be unaffected by ice during the winter perio

Rating table for Raritan River at Finderne, N. J., for 1905 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.40	105	4.80	1,064	6.20	2,585	8.20	5,110
3.50	140	4.90	1,159	6.30	2,705	8.40	5,380
3.60	180	5.00	1,255	6.40	2,825	8.60	5,650
3.70	225	5.10	1,355	6.50	2,945	8.80	5,930
3.80	275	5.20	1,460	6.60	3,065	9.00	6,210
3.90	330	5.30	1,565	6.70	3,190	9.20	6,500
4.00	393	5.40	1,675	6.80	3,315	9.40	6,800
4.10	461	5.50	1,785	6.90	3,440	9.60	7,100
4.20	534	5.60	1,895	7.00	3,565	9.80	7,410
4.30	612	5.70	2,005	7.20	3,815	10.00	7,730
4.40	695	5.80	2,120	7.40	4,065	11.00	9,430
4.50	783	5.90	2,235	7.60	4,325	12.00	11,130
4.60	875	6.00	2,350	7.80	4,585		
4.70	969	6.10	2,465	8.00	4,845		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 14 discharge measurements made during 1903 to 1906, and is well defined between gage heights 3.9 feet and 10.0 feet. Above gage height 10.0 feet the rating curve is a tangent, the difference being 170 per tenth.

Monthly discharge of Raritan River at Finderne, N. J., for 1906.

[Drainage area, 490 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
anuary	5,930	497	1,150	2.35	2.71
ebruary	4,650	330	843	1.72	1.79
arch	10,500	380	1,490	3.04	3.50
pril	8,550	476	1,490	3.04	3.39
ay	3,540	235	616	1.26	1.45
une	1,210	189	449	.916	1.02
ly	4,840	189	673	1.37	1.58
ugust	1,460	180	407	.831	.96
eptember	765	133	207	.422	.47
ctober	4,200	160	521	1.06	1.22
ovember	1,510	235	461	.941	1.05
ecember	2,370	112	673	1.37	1.58
The year	10,500	112	748	1.53	20.72

NOTE.—Values are rated as follows: January to December, excellent, except September, which is od. Flow probably not materially affected by ice during the winter months.

RARITAN RIVER AT BOUNDBROOK, N. J.

This station was established September 12, 1903. It is located at ie highway bridge just back of the Lehigh Valley Railroad station at oundbrook, N. J. The conditions and the bench marks are described ı Water-Supply Paper No. 167, page 73, where are given also eferences to publications that contain data for previous years.

The following discharge measurement was made May 2, 1906:

Width, 357 feet; area, 983 square feet; gage height, 1.50 feet; discharge, 701 second-eet.

Daily gage height, in feet, of Raritan River at Boundbrook, N. J., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.75	1.6	1.85	2.7	1.5	1.75	1.45	1.45	1.2	1.5	2.35	1.4
2	1.7	1.45	1.85	2.25	1.45	1.6	1.35	1.55	1.2	1.5	1.8	1.3
3	1.6	1.3	2.95	2.05	1.6	1.55	1.25	2.3	1.2	1.45	1.7	1.3
4	5.4	1.45	8.8	1.9	1.55	1.45	1.05	3.05	1.2	1.5	1.55	1.15
5	3.9	1.3	5.3	2.0	1.5	1.4	2.45	2.4	1.2	3.1	1.5	1.35
6	2.85	1.3	2.95	1.85	1.5	1.4	2.15	1.9	1.2	2.05	1.5	1.4
7	2.15	1.2	2.45	1.8	1.55	1.35	1.8	1.6	1.15	1.8	1.5	1.75
8	2.0	1.2	2.45	1.7	1.55	1.3	1.55	1.5	1.15	1.65	1.4	1.6
9	1.9	1.5	2.23	1.8	1.5	1.3	1.45	1.6	1.15	1.5	1.45	1.6
0	2.0	1.5	2.05	7.62	1.6	1.3	1.5	1.6	1.1	1.45	1.45	1.5

Daily gage height, in feet, of Raritan River at Boundbrook, N. J., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	2.0	1.4	2.0	4.3	1.55	1.3	1.75	1.6	1.1	1.5	1.5	2.6
12	1.9	1.3	1.95	3.05	1.5	1.25	1.45	1.65	1.1	1.4	1.6	2.8
13	1.85	1.35	1.7	2.4	1.5	1.2	1.35	1.45	1.3	1.4	1.55	2.15
14	1.55	1.85	1.8	2.25	1.45	1.2	1.3	1.35	1.5	1.35	1.5	1.75
15	2.05	2.65	1.8	4.05	1.4	1.2	1.25	1.25	1.5	1.25	1.5	1.65
16	2.5	2.2	1.7	3.85	1.4	1.3	1.2	1.2	1.5	1.2	1.65	1.75
17	2.85	2.05	1.8	2.85	1.4	1.5	1.35	1.2	1.5	1.3	1.75	2.1
18	2.15	1.85	1.7	2.3	1.45	1.6	1.65	1.2	1.5	1.35	1.9	2.05
19	2.4	1.55	1.6	2.25	1.45	2.4	1.55	1.2	1.5	1.45	2.5	1.8
20	2.25	1.65	1.9	2.05	1.35	1.95	1.35	1.15	1.45	1.6	2.2	1.9
21	1.95	1.85	1.95	2.05	1.3	1.65	1.45	1.55	1.45	2.1	2.0	3.65
22	2.0	4.35	1.9	1.8	1.3	1.6	2.15	2.4	1.6	2.3	1.85	3.6
23	2.0	2.35	1.85	1.95	1.3	1.55	1.6	1.6	2.05	1.95	1.75	2.45
24	2.0	2.05	1.75	2.1	1.25	2.15	1.5	1.35	1.55	1.85	1.7	1.4
25	1.95	2.05	1.7	1.95	1.2	1.45	1.4	1.35	1.5	1.95	1.65	1.4
26	1.8	2.65	1.85	1.75	1.2	1.45	1.3	1.35	1.5	1.85	1.55	1.7
27	1.6	2.1	3.05	1.75	1.25	1.0	1.3	1.3	1.45	1.75	1.6	1.7
28	1.7	1.8	5.4	1.6	2.0	1.1	1.3	1.35	1.45	1.65	1.5	1.7
29	1.8	.....	4.1	1.65	4.15	1.25	1.9	1.35	1.5	1.5	1.4	1.8
30	1.55	.....	3.1	1.5	2.4	1.5	2.4	1.35	1.5	1.5	1.4	1.8
31	1.6	.....	3.2	.....	1.85	.....	1.85	1.25	.....	1.5	.....	2.5

NOTE.—River frozen February 4 to 12, December 4, 7 to 10, and 24 to 29.

Rating table for Raritan River at Boundbrook, N. J., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	275	2.20	1,580	3.40	3,610	5.20	7,500
1.10	350	2.30	1,730	3.50	3,800	5.40	7,980
1.20	430	2.40	1,890	3.60	4,000	5.60	8,480
1.30	520	2.50	2,050	3.70	4,200	5.80	8,980
1.40	615	2.60	2,210	3.80	4,400	6.00	9,500
1.50	715	2.70	2,370	3.90	4,600	6.20	10,030
1.60	820	2.80	2,540	4.00	4,800	6.40	10,570
1.70	930	2.90	2,710	4.20	5,220	6.60	11,120
1.80	1,050	3.00	2,880	4.40	5,660	6.80	11,680
1.90	1,170	3.10	3,060	4.60	6,100	7.00	12,250
2.00	1,300	3.20	3,240	4.80	6,560	8.00	15,200
2.10	1,440	3.30	3,420	5.00	7,020	9.00	18,340

NOTE.—The above table is applicable only for open-channel conditions. It is based on 12 discharge measurements made during 1903 to 1906 and is well defined between gage heights 1.0 foot and 3.0 feet. The extension is based on one high-water measurement at gage height 7.35 feet.

Monthly discharge of Raritan River at Boundbrook, N. J., for 1906.

[Drainage area, 800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	7,980	767	1,680	2.04	2.3
February[a]	5,550	430	1,170	1.46	1.5
March	17,700	820	2,560	3.20	3.6
April	14,100	715	2,190	2.74	3.0
May	5,110	430	866	1.08	1.2
June	1,890	275	706	.882	.9
July	4,900	430	960	1.20	1.3
August	2,970	390	831	1.04	1.2
September	1,370	350	603	.754	.8
October	3,060	430	917	1.15	1.3
November	2,050	615	926	1.16	1.3
December	4,100	390	1,240	1.55	1.7
The year	17,700	275	1,220	1.52	20.6

[a] Discharge applied during frozen period as if open channel conditions existed.

NOTE.—Values are rated as follows: January, and March to November, good; February and December, fair.

DELAWARE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Delaware River rises in Delaware, Greene, and Schoharie counties, N. Y., the source of the main stream, which is commonly known as West Branch, to distinguish it from the smaller East or Pepacton Branch, being a small lake almost on the line of Schoharie and Delaware counties, at an elevation of 1,886 feet above tide. From this lake it flows southwestward across central Delaware County to Deposit, where it receives Oquaga Creek, a large tributary draining eastern Broome County, and turns abruptly to the southeast, forming the boundary line between New York and Pennsylvania until Port Jervis is reached. Here it turns again to the southwest and flows for a distance of about 40 miles along the base of the Shawangunk Range until it passes through the water gap, from which point it flows irregularly southward to Trenton. Below Trenton the course is in general southwestward to Delaware Bay. South of Port Jervis it forms the dividing line between Pennsylvania and New Jersey, and for a few miles between Delaware and New Jersey.

East Branch rises at Grand Gorge, in northeastern Delaware County, and flows parallel to West Branch across southern Delaware County, uniting with the latter stream at Hancock.

The total length of the river from the mouth to the head of West Branch is about 410 miles; its drainage area, measured at Philadelphia and including Schuylkill River, is 10,100 square miles, of which about 3,580 square miles lie in New York, 5,720 in Pennsylvania, and 1,800 in New Jersey. The river is tidal to Trenton, which lies also at the head of navigation.

The Delaware receives a number of important tributaries, among which may be mentioned Mongaup and Neversink rivers and Callicoon Creek from New York; Lackawaxen, Lehigh, and Schuylkill rivers and numerous creeks from Pennsylvania, and Rancocas Creek, Musconetcong River, and Maurice River from New Jersey.

Measurements of the flow of Delaware River were made during the last half of June, 1891, by Prof. Dwight Porter and students at Delaware Watergap, Pa. The results show a flow from 2,000 to 2,200 second-feet. This was said to be the lowest June stage for five years. Measurements were made during the drought of 1895 by Prof. L. M. Haupt at Point Pleasant, Pa., near the intake of the Delaware and Raritan Canal feeder. The discharge above the bridge was 1,657 second-feet and below the bridge 1,328 second-feet. The discharge was measured by E. G. Paul June 4, 1899, at Martins Creek, Pa., 7 miles above the mouth of Lehigh River, and found to be 2,724 second-feet.

WEST BRANCH DELAWARE RIVER AT HANCOCK, N. Y.

This station was established October 15, 1902. It is located c half mile west of the Erie Railroad station at Hancock, N. Y., about 1 mile above the mouth of East Branch. The conditions the bench marks are described in Water-Supply Paper No. 167, p 78, where are given also references to publications that contain c for previous years.

Information in regard to this station is contained in the ann reports of the State engineer and surveyor of New York.

Discharge measurements of West Branch Delaware River at Hancock, N. Y., in 19

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Disch
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
March 29	Horton and Mott	243	949	5.50	
March 31	do	250	1,080	6.10	
April 12	Covert and Weeks	248	1,080	6.15	
April 13	do	243	1,040	5.90	
July 25	C. C. Covert	196	349	3.22	
October 6	do	200	335	3.02	

Daily gage height, in feet, of West Branch Delaware River at Hancock, N. Y., for 1

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.70	4.00	3.80	5.40	3.60	4.00	4.25	3.28	3.40	3.20	4.00
2	3.65	3.70	3.88	5.15	3.45	3.90	3.78	3.12	3.20	3.20	3.85
3	3.40	4.55	4.00	4.90	3.75	3.80	3.60	3.22	3.30	3.10	3.80
4	5.40	4.55	8.30	4.30	3.88	3.60	3.75	3.25	3.18	3.02	3.70
5	5.45	5.00	5.75	5.80	3.70	3.58	3.75	3.20	3.20	3.00	3.62
6	4.35	4.90	5.00	6.30	3.60	4.80	3.50	3.12	3.08	2.98	3.52
7	3.75	4.80	4.75	5.80	3.52	4.55	3.45	3.32	3.05	3.02	3.40
8	3.55	4.95	4.48	5.45	3.60	4.30	3.30	4.38	3.02	3.05	3.32
9	3.30	5.00	4.40	5.20	3.55	4.05	3.28	3.60	3.05	3.05	3.35
10	4.35	4.85	4.30	6.25	3.68	4.40	3.30	3.42	3.00	3.05	3.20
11	4.25	4.75	4.05	6.90	3.62	4.50	3.35	3.30	2.98	3.00	3.20
12	4.72	4.85	3.85	6.20	3.55	4.15	3.30	3.10	2.88	3.08	3.50
13	5.05	4.80	3.82	5.80	3.55	3.95	3.15	3.20	2.85	3.08	3.45
14	4.85	4.75	3.70	5.65	3.62	3.80	3.15	3.10	2.82	2.95	3.42
15	4.50	4.65	3.75	7.25	3.62	3.70	3.02	3.05	2.82	3.05	3.25
16	4.35	4.45	3.55	7.60	3.55	4.62	3.10	3.00	2.78	3.00	3.20
17	4.20	4.40	3.65	6.45	3.42	6.92	3.08	2.95	2.68	2.95	3.25
18	4.10	4.40	3.30	5.85	3.65	6.35	3.35	2.90	2.70	2.90	3.58
19	3.90	4.50	3.85	5.35	3.72	5.70	3.35	2.95	2.62	2.95	6.30
20	3.70	4.35	3.40	5.15	3.60	5.28	3.15	2.80	2.85	3.80	5.50
21	3.80	4.45	3.55	4.85	3.50	4.85	3.12	3.65	3.38	4.70	5.35
22	5.35	6.55	3.50	4.70	3.45	4.55	3.05	3.40	3.08	4.20	5.20
23	5.38	5.00	3.35	4.55	3.38	4.42	3.20	3.35	3.65	4.05	4.82
24	6.70	4.75	4.00	4.30	3.40	4.30	3.30	3.18	3.25	3.90	4.55
25	5.60	5.10	3.78	4.25	3.35	4.02	3.20	3.15	3.20	3.95	4.35
26	5.00	5.60	3.60	4.05	3.25	3.82	3.12	3.08	3.05	4.20	4.30
27	4.80	4.50	4.10	3.98	3.35	3.75	3.18	3.30	3.08	3.95	4.20
28	4.50	3.90	7.85	3.85	4.00	3.65	2.90	4.58	3.15	3.92	4.05
29	4.20	.....	5.60	3.78	4.70	3.70	3.02	4.22	2.98	4.02	3.95
30	4.10	.....	5.45	3.70	4.35	3.60	3.20	3.80	3.00	3.82	3.85
31	4.10	.....	6.20	.....	4.10	.....	3.35	3.55	.....	3.98	.....

NOTE.—River obstructed by ice January 3 to March 2; clear channel from March 3 to 19, app mately; more or less obstructed by ice and needle ice from the latter date to March 28.

The river seldom freezes solid at the gage and all readings are to water surface, a channel a 10 feet wide near the left bank being kept open by oil and hot water from a pumping station one mile above the gage.

There is considerable needle ice in the stream the greater part of the frozen period, makin discharge very uncertain. Attempts to make meter measurements here in 1904-5 were unsucce on this account. Needle ice forming on the rifts a few hundred feet below the gage during the period often causes backwater.

Rating table for West Branch Delaware River at Hancock, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.60	100	3.70	695	4.80	2,130	5.90	4,440
2.70	130	3.80	790	4.90	2,300	6.00	4,700
2.80	165	3.90	890	5.00	2,470	6.20	5,230
2.90	205	4.00	1,000	5.10	2,650	6.40	5,780
3.00	245	4.10	1,120	5.20	2,840	6.60	6,310
3.10	290	4.20	1,250	5.30	3,040	6.80	6,920
3.20	340	4.30	1,380	5.40	3,250	7.00	7,510
3.30	400	4.40	1,520	5.50	3,470	7.20	8,120
3.40	465	4.50	1,660	5.60	3,700	7.40	8,740
3.50	535	4.60	1,810	5.70	3,940	7.60	9,380
3.60	610	4.70	1,970	5.80	4,190		

OTE.—The above table is applicable only for open-channel conditions. It is based upon 6 discharge asurements made during 1906 and other measurements made during previous years. It is fairly l defined.

Monthly discharge of West Branch Delaware River at Hancock, N. Y., for 1906.

[Drainage area, 680 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ril	9,380	695	3,440	5.06	5.64
ay	1,970	370	684	1.01	1.16
ne	7,270	595	1,670	2.46	2.74
ly	1,320	205	432	.635	.73
gust	1,780	165	484	.712	.82
ptember	652	106	277	.407	.45
tober	1,970	205	574	.844	.97
vember	5,500	340	1,180	1.74	1.94
cember	3,700	267	1,390	2.04	2.35

NOTE.—Values are rated as follows: April to November, good; ice conditions for December not nown, rated as fair.

EAST BRANCH DELAWARE RIVER AT HANCOCK, N. Y.

This station was established October 14, 1902. It is located at the ighway bridge one-half mile southeast of the Erie Railroad station at Iancock, N. Y., and 1 mile above the junction with West Branch of he Delaware. The Erie Railroad bridge is just below the station. The conditions at the station and the bench marks are described in Water-Supply Paper No. 167, page 81, where are given also references to publications that contain data for previous years.

Information in regard to this station is contained in the annual reports of the State engineer and surveyor of New York.

Discharge measurements of East Branch Delaware River at Hancock, N. Y., in 190

Date.	Hydrographer.	Width.	Area of section.	Gage height	Discha
		Feet.	*Sq. ft.*	*Feet.*	*Sec.*
March 29	Horton and Mott	335	1,150	4.88	4
March 31	do	337	1,400	5.68	5
April 12	Covert and Weeks	337	1,560	6.10	7
April 13	do	339	1,410	5.78	6
July 26	C. C. Covert	274	669	3.40	
October 6	do	260	490	2.90	

Daily gage height, in feet, of East Branch Delaware River at Hancock, N. Y., for 19

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	3.58	3.92	7.95	5.05	3.68	4.35	3.60	3.30	3.35	3.12	3.92	3
2	3.52	3.70	10.70	4.85	3.60	4.22	3.45	3.18	3.25	3.02	3.80	3
3	3.42	3.05	10.65	4.62	3.75	4.05	3.40	3.22	3.25	2.92	3.70	3
4	4.28	3.85	10.00	4.75	3.75	3.85	3.55	3.45	3.35	2.88	3.60	4
5	4.42	3.95	6.05	5.55	3.62	3.78	3.60	3.35	3.18	2.90	3.52	4
6	3.90	4.10	5.05	6.28	3.60	4.50	3.42	3.25	3.10	2.90	3.50	4
7	3.65	4.35	4.80	5.60	3.60	4.40	3.28	3.25	3.02	2.95	3.42	4
8	3.45	4.35	4.45	5.30	3.62	4.15	3.20	3.40	3.00	3.08	3.40	4
9	3.40	4.75	4.35	5.15	3.65	3.98	3.12	3.38	2.95	2.95	3.32	3
10	3.25	4.60	4.25	5.80	4.05	5.85	3.12	3.22	2.90	2.95	3.30	4
11	3.68	4.80	3.95	7.05	3.85	5.58	3.20	3.18	2.90	3.00	3.35	4
12	4.22	4.70	3.95	6.15	3.75	4.88	3.15	2.10	2.85	3.05	3.48	4
13	4.85	4.75	3.75	5.75	3.70	4.48	3.08	3.02	2.80	3.02	3.50	4
14	4.05	4.65	3.72	5.70	3.70	4.25	3.00	3.00	2.80	2.98	3.40	4
15	3.75	4.50	3.70	8.37	3.65	4.05	2.98	2.92	2.78	2.92	3.32	4
16	3.65	4.40	3.45	8.40	3.58	4.32	2.92	2.90	2.75	2.90	3.30	4
17	3.68	4.25	3.65	6.65	3.50	4.65	2.95	2.85	2.70	2.90	3.48	4
18	3.58	4.22	3.50	5.95	3.82	5.00	3.08	2.80	2.70	2.85	3.38	4
19	3.50	4.28	3.50	5.48	3.90	4.75	3.05	2.80	2.70	2.85	6.10	3
20	3.55	4.28	3.65	5.22	3.75	4.60	3.00	2.85	2.75	4.85	5.70	3
21	3.48	4.30	3.58	4.95	3.62	4.35	4.40	3.45	3.05	4.80	5.40	4
22	4.55	5.05	3.60	4.75	3.55	4.20	3.80	3.78	3.15	4.25	5.25	3
23	5.10	4.60	3.40	4.58	3.50	4.08	3.70	3.45	3.20	3.95	4.85	3
24	7.10	4.30	3.45	4.45	3.42	3.98	3.80	3.25	3.15	3.78	4.55	3
25	5.60	4.50	3.50	4.28	3.38	3.78	3.60	3.25	2.95	4.12	4.42	4
26	5.00	5.15	3.50	4.15	3.32	3.65	3.40	3.10	2.88	4.60	4.25	4
27	4.72	4.30	3.62	4.05	3.30	3.55	3.30	3.32	2.90	4.25	4.10	5
28	4.55	4.75	6.60	3.88	4.80	3.45	3.22	4.58	2.90	4.30	4.02	5
29	4.30	.....	5.05	3.80	5.35	3.48	3.30	4.00	2.88	4.15	3.92	4
30	4.10	.....	5.00	3.72	4.85	3.38	3.30	3.65	2.88	4.00	3.75	4
31	4.05	.....	5.60	.....	4.55	.....	3.55	3.52	.....	4.00	.....	4

NOTE.—Channel full of needle ice during greater part of January; river frozen February 1 to 22, 0.3 to 0.75 foot thick; open February 22 and 23, also after March 4, although there was consider anchor and needle ice until about March 27. Some anchor ice during December.

Rating table for East Branch Delaware River at Hancock, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.70	225	3.90	1,610	5.10	4,215	6.60	8,730
2.80	285	4.00	1,780	5.20	4,475	6.80	9,460
2.90	355	4.10	1,960	5.30	4,740	7.00	10,210
3.00	440	4.20	2,150	5.40	5,010	7.20	10,980
3.10	510	4.30	2,350	5.50	5,285	7.40	11,760
3.20	650	4.40	2,560	5.60	5,565	7.60	12,560
3.30	770	4.50	2,780	5.70	5,850	7.80	13,360
3.40	890	4.60	3,000	5.80	6,140	8.00	14,200
3.50	1,020	4.70	3,230	5.90	6,435	8.20	15,040
3.60	1,160	4.80	3,470	6.00	6,735	8.40	15,920
3.70	1,300	4.90	3,710	6.20	7,365		
3.80	1,450	5.00	3,960	6.40	8,025		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 15 disch *measurements made during 1904-1906*, and is fairly well defined between gage heights 2.9 feet *7.5 feet.*

ly discharge of East Branch Delaware River at Hancock, N. Y., for 1906.

[Drainage area, 920 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	15,900	1,330	5,260	5.72	6.38
.....	4,880	770	1,540	1.67	1.92
.....	6,290	866	2,390	2.60	2.90
.....	2,560	372	852	.926	1.07
.....	2,960	285	801	.871	1.00
.....	830	225	436	.474	.53
.....	3,530	320	1,140	1.24	1.43
.....	7,040	770	1,960	2.13	2.38
.....	4,220	1,050	2,270	2.47	2.85

lues are rated as follows: April to November, good; December, fair.

DELAWARE RIVER AT RIEGELSVILLE, N. J.

ation was established July 3, 1906. It is located at the toll onnecting Riegelsville, N. J., and Riegelsville, Pa. The tcong enters the Delaware 600 or 700 feet below the station. nannel is straight for one-half mile above and one-fourth mile ne station. Both banks are steep and wooded and will not except in extreme flood. The bed of the stream is composed l and bowlders. It may shift somewhat near the piers. The water is 12 to 15 feet at ordinary stages.

arge measurements are made from the suspension bridge to he gage is attached. The initial point for soundings is the the left abutment.

hain gage, which was read during 1906 by John H. Deemer, ned to the hand rail in the middle span, 20 feet from the east ngth of chain, 43.67 feet. The bench mark is on the top of l part of the downstream cable anchorage at the left bank; n, 39.76 feet above the gage datum.

ollowing measurement was made July 3, 1906:

492 feet; area, 4,440 square feet; gage height, 4.52 feet; discharge, 8,550 et.

ily gage height, in feet, of Delaware River at Riegelsville, N. J., for 1906.

July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.12	3.42	2.45	4.78	4.18	17	3.10	2.89	2.16	2.54	3.56	4.86
.....	3.89	3.20	2.44	4.56	3.96	18	3.10	2.71	2.21	2.46	3.18	5.36
... 4.45	3.88	3.12	2.50	4.44	4.08	19	3.05	2.70	2.29	2.42	4.55	4.51
.. 5.44	4.81	3.32	2.59	4.20	3.59	20	3.05	2.60	2.19	2.49	7.44	4.19
... 5.50	4.60	3.18	3.20	4.08	3.31							
						21	3.01	2.78	2.32	4.90	7.72	4.86
... 5.14	4.18	3.12	3.28	3.94	3.66	22	3.42	2.92	2.50	6.42	7.10	5.15
... 4.68	3.99	2.96	2.90	3.84	4.08	23	4.08	3.05	3.54	5.35	6.71	5.25
... 4.26	3.72	2.80	2.85	3.70	5.16	24	4.18	3.18	3.71	4.75	6.06	4.28
.. 3.99	3.69	2.68	2.85	3.58	4.66	25	4.06	3.42	2.64	4.76	5.46	3.51
... 3.96	4.02	2.65	2.78	3.55	4.38							
						26	3.80	3.18	2.65	5.62	5.19	3.62
... 3.90	3.82	2.51	2.72	3.41	4.58	27	3.52	3.28	2.64	5.76	4.95	3.68
... 3.78	3.65	2.45	2.72	3.55	4.51	28	3.40	3.66	2.52	5.29	4.69	3.92
... 3.60	3.46	2.52	2.68	3.61	4.59	29	3.58	3.60	2.45	5.10	4.42	4.22
... 3.45	3.24	2.42	2.58	3.75	4.58	30	3.70	4.25	2.48	4.86	4.34	4.38
... 3.22	3.12	2.30	2.55	3.66	4.50	31	3.98	3.82	.....	5.01	.....	5.38
... *3.15*	*2.98*	*2.20*	*2.64*	*3.76*	*4.58*							

DELAWARE RIVER AT LAMBERTVILLE, N. J.

This station was established July 22, 1897. It is located at the toll bridge at Lambertville, N. J. The conditions and the bench marks are described in Water-Supply Paper No. 167, page 85, where are given also references to publications that contain data for previous years.

Discharge measurements of Delaware River at Lambertville, N. J., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 1[a]	Robert Follansbee	982	5,760	5.16	11,000
July 4[a]	do		5,800	5.36	12,000
December 5[abc]	N. C. Grover	945	4,990	4.75	4,910

[a] Discharge of canal not included. [b] Discharge of canal 443 second-feet.
[c] Discharge affected by ice conditions.

Daily gage height, in feet, of Delaware River at Lambertville, N. J., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.0	5.05	5.45	8.1	4.95	5.35	4.45	4.55	4.2	2.65	5.05	4.7
2	4.9	4.8	5.0	7.55	4.9	5.15	4.3	4.45	3.95	2.7	5.0	4.6
3	4.6	4.85	5.45	6.95	4.8	4.95	4.35	4.6	3.85	2.6	4.9	4.6
4	5.55	4.7	11.1	6.55	4.8	4.75	5.35	5.1	3.7	2.8	4.8	4.5
5	5.65	.....	11.8	6.4	4.75	4.55	5.25	5.0	3.9	4.65	4.8	4.1
6	5.35	.....	8.8	7.05	4.75	4.4	4.95	4.75	3.75	4.15	4.55	4.15
7	5.55	.....	7.2	7.85	4.7	4.75	4.75	4.55	3.55	3.8	4.4	4.4
8	5.2	.....	6.65	7.2	4.6	4.95	4.45	4.3	3.35	3.55	4.35	5.3
9	4.8	.....	6.2	6.85	4.65	4.9	4.2	4.25	3.2	3.4	4.3	5.1
10	4.65	.....	6.05	8.35	4.75	4.85	4.1	4.3	3.0	3.25	4.25	4.75
11	4.6	.....	5.95	9.4	4.75	4.8	4.05	4.45	2.85	3.2	4.2	4.75
12	4.5	.....	5.5	9.55	4.6	5.1	3.95	4.3	2.75	3.15	4.3	5.1
13	4.9	4.1	5.4	8.25	4.55	4.95	3.75	4.1	2.7	3.1	4.35	4.95
14	4.9	4.25	5.25	7.65	4.5	4.6	3.65	3.8	2.7	3.1	4.4	4.85
15	4.9	4.35	4.95	8.5	4.4	4.35	3.5	3.7	2.5	3.0	4.35	4.8
16	5.05	4.15	4.85	13.2	4.4	4.15	3.4	3.45	2.5	3.0	4.45	4.8
17	5.05	4.1	4.75	11.4	4.35	4.15	3.4	3.3	2.45	2.9	4.35	5.05
18	4.8	4.05	4.65	9.1	4.3	4.95	3.45	3.15	2.4	2.8	4.35	5.2
19	4.85	3.9	4.85	8.1	4.25	6.9	3.4	3.1	2.4	2.7	4.85	5.0
20	4.75	4.1	4.55	7.25	4.55	7.15	3.4	3.1	2.3	2.85	5.9	4.9
21	4.6	4.3	4.4	6.95	4.35	6.15	3.65	3.05	2.35	4.85	6.7	5.1
22	4.7	6.65	4.45	6.6	4.15	6.05	3.85	3.45	2.55	5.9	6.3	5.35
23	4.85	6.15	4.45	6.05	4.1	5.95	4.45	3.5	2.75	5.45	6.1	5.35
24	6.2	6.3	4.35	6.1	4.05	5.65	4.65	3.9	3.1	5.2	5.8	5.0
25	7.5	6.15	4.3	6.05	3.95	5.25	4.55	4.1	3.05	5.0	5.45	4.6
26	6.85	6.6	4.3	5.85	3.8	4.95	4.45	3.95	2.9	5.0	5.25	4.5
27	6.0	6.85	4.5	5.65	3.9	4.7	4.25	3.85	3.05	5.6	5.05	4.5
28	5.8	6.0	5.9	5.35	4.3	4.45	4.05	4.05	2.95	5.45	4.95	4.4
29	5.65	.....	8.25	5.4	6.25	4.3	4.15	4.3	2.7	5.25	4.85	4.45
30	5.25	.....	7.75	5.05	6.45	4.3	4.25	4.4	2.7	5.1	4.7	4.6
31	5.2	.....	7.6	.....	6.1	.....	4.35	4.5	.....	4.95	.....	5.35

NOTE.—River frozen, February 5 to 12; also probably more or less ice conditions during December.

MUSCONETCONG RIVER NEAR BLOOMSBURY, N. J.

This station was established July 4, 1903. It is located at the first highway bridge over Musconetcong River above the village of Bloomsbury, N. J. The conditions and the bench marks are described in Water-Supply Paper No. 166, page 86, where are given also references to publications that contain data for previous years.

The following discharge measurement was made May 4, 1906:

Area, 116 square feet; gage height, 1.67 feet; discharge, 253 second-feet.

Daily gage height, in feet, of Musconetcong River near Bloomsbury, N. J., for 1906.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.42	1.35	1.67	2.25	1.82	1.98	1.48	1.82	1.18	1.15	1.28	1.15
1.53	1.35	1.48	2.10	1.75	1.98	1.30	1.82	1.15	1.20	1.20	1.12
1.50	1.15	2.80	1.98	1.92	1.98	1.25	2.00	1.25	1.10	1.22	1.25
1.87	1.32	3.75	1.92	1.62	1.90	1.45	1.92	1.22	1.12	1.10	1.18
1.68	1.30	2.65	1.90	1.40	1.72	1.38	1.88	1.18	1.58	1.15	1.28
1.57	1.13	2.15	1.95	1.38	1.68	1.28	1.85	1.18	1.30	1.10	1.35
1.48	1.20	1.95	1.90	1.42	1.60	1.22	1.70	1.02	1.18	1.02	1.38
1.48	1.30	1.90	1.85	1.45	1.52	1.20	1.65	1.08	1.18	1.15	1.48
1.35	1.25	1.82	1.92	1.55	1.50	1.22	1.60	.92	1.15	.90	1.18
1.40	1.27	1.70	2.90	1.55	1.42	1.30	1.55	1.12	1.12	1.08	1.28
1.37	1.23	1.70	2.75	1.40	1.35	1.35	1.52	1.10	1.15	1.08	1.65
1.47	1.25	1.65	2.65	1.38	1.28	1.28	1.52	1.12	1.15	1.22	1.22
1.50	1.22	1.58	2.35	1.38	1.22	1.22	1.50	1.08	1.12	1.12	1.32
1.50	1.28	1.52	2.28	1.38	1.20	1.15	1.48	.95	1.05	1.18	1.28
1.43	1.25	1.50	2.75	1.40	1.20	1.12	1.45	.90	1.10	1.15	1.35
1.57	1.33	1.50	2.80	1.35	1.28	1.18	1.40	1.02	1.12	1.15	1.42
1.58	1.27	1.50	2.72	1.35	1.70	1.15	1.40	1.12	1.12	1.12	1.48
1.52	1.20	1.48	2.50	1.40	1.48	1.32	1.35	1.12	1.12	1.25	1.42
1.48	1.25	1.50	2.32	1.45	1.70	1.25	1.32	1.10	1.00	1.62	1.28
1.42	1.30	1.50	2.25	1.38	1.52	1.18	1.28	1.12	1.32	1.55	1.35
.....	1.82	1.55	2.12	1.32	1.42	1.18	1.35	1.15	1.42	1.42	1.65
1.42	3.12	1.62	2.05	1.28	1.52	1.30	1.30	1.15	1.38	1.35	1.48
1.47	2.08	1.55	2.05	1.28	1.58	1.28	1.28	1.10	1.25	1.25	1.45
1.47	1.87	1.55	2.18	1.25	1.65	1.22	1.32	1.10	1.20	1.22	1.32
1.75	1.80	1.53	2.10	1.20	1.48	1.18	1.20	1.10	1.22	1.20	1.45
1.82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1.48	1.82	1.57	2.08	1.22	1.48	1.15	1.22	1.06	1.20	1.20	1.45
1.40	1.68	2.02	1.92	1.20	1.42	1.15	1.22	1.10	1.20	1.20	1.32
1.43	1.32	2.53	1.85	1.78	1.35	1.20	1.32	1.15	1.12	1.22	1.32
1.40	.....	2.35	1.90	2.98	1.32	1.75	1.35	1.08	1.18	1.22	1.30
1.37	.....	2.23	1.92	2.98	1.32	2.20	1.30	1.15	1.15	1.22	1.32
1.38	.....	2.25	.....	2.20	.....	1.88	1.28	.....	1.18	.....	2.18

NOTE.—River two-thirds frozen over February 6 to 7 and 16 and December 24 to 28.

Rating table for Musconetcong River near Bloomsbury, N. J., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	56	1.70	251	2.50	538	3.20	821
1.00	69	1.80	283	2.60	578	3.30	862
1.10	86	1.90	317	2.70	618	3.40	903
1.20	107	2.00	352	2.80	658	3.50	945
1.30	132	2.10	388	2.90	698	3.60	987
1.40	160	2.20	424	3.00	739	3.70	1,030
1.50	190	2.30	461	3.10	780	3.80	1,073
1.60	220	2.40	499				

NOTE.—The above table is applicable only for open-channel conditions. It is based on 9 discharge measurements made during 1903 to 1906, and is well defined between gage heights 1.0 foot and 2.9 feet.

Monthly discharge of Musconetcong River near Bloomsbury, N. J., for 1906.

[Drainage area 146 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
January	307	132	184	1.26	
February	788	92	185	1.27	
March	1,050	184	319	2.18	
April	698	300	429	2.94	
May	731	107	217	1.49	
June	345	107	200	1.37	
July	424	90	141	.966	
August	352	107	189	1.29	
September	119	56	87.8	.601	
October	214	69	107	.733	
November	226	56	111	.760	
December	417	90	156	1.07	
The year	1,050	56	194	1.33	

NOTE.—Values are rated as follows: January to March and December, good; April to Novem excellent. No corrections made in estimates of flow under ice conditions; flow not considered t materially affected by ice.

TOHICKON CREEK AT POINT PLEASANT, PA.

Measurements of the discharge of Tohickon Creek are made ne its mouth at Point Pleasant. Gage heights are furnished by John Codman, hydrographer of the water department of Philadelphia. T conditions at the station and the bench marks are described in Wat Supply Paper No. 166, page 89, where are given also references publications that contain data for previous years.

Daily discharge, in second-feet, of Tohickon Creek at Point Pleasant, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1	76.4	79.0	109.0	368.5	38.8	50.0	15.8	25.7	*14.6*	*3.5*	324.5	30
2	*57.9*	*57.5*	75.6	157.0	27.2	38.8	18.1	22.2	10.2	4.7	136.0	51
3	80.5	61.2	1,557.7	105.5	26.8	23.7	26.8	25.2	7.0	6.6	59.8	25
4	*1,359.3*	74.7	*2,935.8*	80.5	26.4	20.0	*611.0*	*723.1*	8.6	5.2	43.8	21
5	701.8	71.0	657.7	72.5	22.3	21.4	157.2	267.7	5.2	*138.1*	34.8	26
6	232.0	71.0	210.0	68.9	20.1	17.5	63.6	57.2	10.3	46.5	31.4	31
7	111.0	71.0	147.5	65.5	24.6	19.2	41.6	31.9	11.1	31.5	26.3	101
8	75.8	71.0	153.5	58.7	26.8	20.9	32.3	22.3	7.2	23.1	21.7	60
9	75.8	71.0	167.5	664.4	28.8	14.5	32.3	25.3	6.3	17.6	23.1	61
10	111.0	79.0	142.0	*3,196.4*	32.6	9.7	26.1	29.0	3.1	13.3	18.8	51
11	170.5	79.0	104.0	719.0	30.6	14.4	13.2	27.9	4.3	12.5	*14.5*	201
12	205.5	71.0	83.5	291.0	27.6	17.1	12.9	21.5	3.0	9.7	48.5	109
13	201.0	64.5	75.5	155.0	18.4	12.9	13.4	19.7	6.5	9.7	38.0	51
14	249.5	124.0	67.6	80.3	12.6	11.0	12.2	21.1	2.8	8.2	36.5	67
15	272.0	182.5	58.7	1,719.9	22.0	10.1	10.9	15.7	4.6	8.8	29.5	49
16	510.5	141.0	65.0	1,210.5	18.9	8.4	9.8	10.3	4.9	8.6	35.9	71
17	505.5	97.0	71.2	338.5	15.2	*7.0*	14.5	9.8	*2.8*	5.5	41.6	449
18	210.0	75.6	65.5	130.0	15.2	267.9	21.8	9.8	3.1	7.7	473.3	427
19	168.0	70.6	57.1	102.5	16.9	*1,002.5*	20.1	*5.9*	4.3	8.2	*823.5*	122
20	133.5	448.2	59.8	79.0	13.1	459.8	12.4	6.2	5.9	25.0	359.5	337
21	137.5	978.3	71.0	64.5	10.7	54.3	8.6	7.5	5.1	76.5	145.5	821
22	172.0	*1,763.1*	60.7	55.1	9.9	87.0	*5.2*	13.8	4.5	103.0	89.0	527
23	166.0	446.8	55.4	52.2	10.5	83.5	7.9	35.6	3.9	77.5	64.5	226
24	475.5	253.5	51.2	51.3	9.2	64.3	7.9	21.0	4.2	53.4	53.4	48
25	229.5	390.5	*43.5*	49.5	*4.4*	48.7	8.6	11.9	7.2	77.9	43.8	48
26	102.0	426.0	54.6	44.3	7.1	43.3	8.6	9.4	3.8	112.5	39.0	48
27	77.0	163.0	1,302.9	39.5	20.5	30.0	6.3	13.4	4.6	83.0	39.0	48
28	204.5	101.0	2,689.0	39.0	222.8	22.0	8.1	22.3	5.3	42.5	34.8	48
29	237.5	.....	956.2	*29.7*	*943.9*	17.6	7.7	24.9	3.9	33.4	31.0	59
30	110.0	.....	394.0	33.7	301.0	19.1	44.8	21.8	4.2	31.0	31.0	67
31	85.0	.....	599.1	.....	75.0	.....	33.9	14.6	.....	39.2	.....	1,86

NOTE.—Italic figures indicate maximum and minimum.

Monthly discharge of Tohickon Creek at Point Pleasant, Pa., for 1906.

[Drainage area, 102 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	1,360	57.9	242	2.37	2.73
February	1,760	57.5	235	2.30	2.40
March	2,980	43.5	424	4.16	4.80
April	3,200	29.7	337	3.30	3.68
May	944	4.4	67.1	.658	.76
June	1,000	7.0	83.9	.823	.92
July	611	5.2	42.4	.416	.48
August	723	5.9	50.7	.497	.57
September	14.6	2.8	5.8	.056	.06
October	138	3.5	36.3	.356	.41
November	824	14.5	106	1.04	1.16
December	1,860	21.4	198	1.94	2.24
The year	3,200	2.8	152	1.49	20.21

NESHAMINY CREEK AT FORKS, PA.

This station is located at the forks of Big and Little Neshaminy creeks. The table of daily discharge for 1906 was furnished by John E. Codman, hydrographer of the Philadelphia water department. The conditions at the station and the bench marks are described in Water-Supply Paper No. 166, page 90, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Neshaminy Creek at forks, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	125.5	134.0	233.5	362.0	84.5	81.0	217.0	66.5	59.0	*18.5*	414.0	71.0
2	107.0	111.5	147.5	242.0	81.5	68.0	210.5	268.3	46.5	18.5	376.0	*62.0*
3	126.5	135.0	2,048.5	198.0	81.5	59.0	1,048.2	*1,502.1*	44.5	21.5	131.0	62.0
4	*1,539.4*	150.0	*3,050.2*	175.5	80.0	54.0	*2,786.2*	318.5	43.5	23.5	114.0	86.0
5	496.7	106.5	540.5	166.0	209.5	47.5	357.0	128.5	35.0	28.5	99.0	87.0
6	267.5	88.0	327.5	162.0	286.5	41.0	250.0	134.5	38.5	*2,412.5*	94.0	108.0
7	200.5	88.0	272.5	152.0	153.0	44.5	148.5	113.5	42.0	259.5	82.5	116.0
8	171.0	*80.0*	279.0	135.5	114.5	44.5	127.0	103.5	36.5	128.5	75.0	91.0
9	154.0	157.0	267.5	828.0	96.0	38.5	124.5	105.0	31.0	98.0	73.5	88.5
10	153.0	227.5	217.5	*2,079.4*	96.0	36.5	124.5	96.5	28.0	73.5	72.0	97.0
11	151.0	188.5	177.5	467.5	88.5	39.0	100.0	96.5	25.7	68.0	86.0	369.3
12	362.0	154.0	163.0	316.0	76.5	34.0	80.0	100.5	22.5	66.0	138.8	303.5
13	448.0	396.3	154.0	245.0	68.0	26.0	76.5	84.0	*596.4*	54.5	106.5	187.5
14	318.7	678.4	123.0	209.5	61.0	25.5	69.0	72.0	101.0	41.5	*71.0*	72.0
15	362.0	*1,092.5*	123.0	2,064.7	52.0	*24.3*	63.0	63.0	57.5	38.0	71.0	72.0
16	648.0	188.0	305.5	777.5	47.5	760.6	59.0	57.0	31.0	38.0	108.0	88.5
17	424.2	115.0	116.0	319.5	51.5	1,111.5	390.5	50.5	22.5	34.5	146.0	679.6
18	256.5	125.0	144.0	250.5	44.0	2,256.6	166.0	47.0	109.5	31.0	400.5	483.0
19	242.0	115.0	142.0	218.5	33.5	*2,736.5*	73.0	*43.0*	104.5	31.0	*619.7*	200.5
20	200.5	124.5	164.0	196.0	32.0	524.5	56.0	43.0	34.5	42.5	253.5	538.0
21	138.0	369.7	197.5	171.5	*28.5*	235.5	155.5	47.0	121.0	139.7	190.5	792.0
22	*88.0*	983.4	175.5	152.0	28.5	303.2	153.5	210.0	45.5	955.3	173.5	549.8
23	138.0	264.5	134.5	143.0	31.0	605.2	61.0	79.5	60.0	550.5	147.5	288.5
24	241.8	180.0	*115.0*	133.5	31.0	895.0	66.0	125.0	60.5	219.0	122.0	144.0
25	183.5	342.5	115.0	125.0	31.0	247.5	54.0	444.7	31.0	163.0	149.0	144.0
26	143.5	635.3	214.0	115.0	31.0	172.0	45.5	168.0	29.0	209.5	141.5	144.0
27	129.0	198.0	2,160.7	100.5	42.5	144.5	43.0	131.5	28.0	196.0	94.0	178.5
28	305.5	144.5	1,226.5	92.0	574.5	123.0	*41.0*	125.5	25.0	126.0	84.5	213.0
29	290.5	.....	739.8	83.5	*1,064.0*	106.5	148.0	96.5	22.0	111.0	78.0	213.0
30	159.5	.....	362.5	*83.5*	209.0	97.0	408.0	85.0	*18.5*	96.5	73.5	178.5
31	142.0	.....	552.0	.....	102.5	.....	116.5	74.0	.....	87.5	.....	*1,755.2*

NOTE.—*Italic figures indicate maximum and minimum.*

Monthly discharge of Neshaminy Creek, at forks, Pennsylvania, for 1906.

[Drainage area, 139 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dept inch
January	1,540	88.0	281	2.02	
February	1,090	80.0	270	1.94	
March	3,050	115.0	484	3.48	
April	2,080	83.5	359	2.58	
May	1,060	28.5	127	.914	
June	2,740	24.3	366	2.63	
July	2,790	41.0	252	1.81	
August	1,500	43.0	164	1.18	
September	596	18.5	651	4.68	
October	2,410	18.5	206	1.48	
November	620	71.0	160	1.15	
December	1,760	62.0	273	1.96	
The year	3,050	18.5	299	2.15	

SCHUYLKILL RIVER NEAR PHILADELPHIA, PA.

Records of the height of the Schuylkill at Fairmount pool have b kept for many years, but not in such form as to be useful in comput daily discharges. In 1898, however, careful estimates were prepa by John E. Codman, in charge of hydrographic work, bureau of wat city of Philadelphia.

The figures for daily discharge in the following table represent total flow of the stream, computed from the amount wasted over flashboards at the Fairmount dam, the pumpage from the river, leakage, and also the quantity used for power at Fairmount. Tl were furnished by John E. Codman. The conditions at the stat are described in Water-Supply Paper No. 166, page 92, where are gi also references to publications that contain data for previous years

Daily discharge, in second-feet, of Schuylkill River at Fairmount dam, near Philadelp Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	I
1	2,143	2,106	2,549	5,445	1,548	1,394	1,216	1,204	727	1,257	1,347	1
2	1,887	1,955	2,440	4,328	1,580	1,352	1,166	1,204	727	1,257	1,347	1
3	*1,695*	1,715	5,991	3,758	1,580	1,352	1,256	2,281	727	1,257	1,347	1
4	*7,811*	1,627	*27,025*	3,229	1,580	1,260	*5,489*	*10,084*	727	1,257	1,347	1
5	6,601	1,719	16,857	2,957	1,580	1,260	2,152	4,172	727	*4,259*	1,347	1
6	4,096	1,627	8,952	2,828	1,580	1,260	1,337	1,507	727	2,382	1,347	1
7	3,515	1,627	5,621	2,739	1,420	1,260	1,166	*1,204*	727	*1,257*	1,347	1
8	3,043	1,627	4,753	2,566	1,420	1,260	1,166	1,204	727	1,257	1,347	1
9	2,642	1,627	4,186	2,853	1,420	1,260	1,105	1,204	727	1,257	1,347	1
10	2,180	1,803	3,590	*16,203*	1,324	1,260	*1,072*	1,204	727	1,257	1,347	1
11	1,942	1,803	3,220	7,836	1,324	1,260	1,072	1,204	727	1,257	1,347	1
12	2,325	*1,627*	2,835	6,271	1,324	1,260	1,072	1,204	727	1,257	1,347	1
13	2,868	1,811	2,704	4,590	1,324	1,260	1,072	1,204	*1,206*	1,257	1,347	1
14	2,787	2,710	2,544	3,729	1,324	1,260	1,072	1,204	987	1,257	1,347	1
15	2,627	3,604	2,544	10,170	1,324	*1,260*	1,072	1,204	755	1,257	1,347	1
16	3,569	2,501	2,544	15,734	1,324	1,778	1,096	1,204	727	1,257	1,347	1
17	4,000	1,813	2,477	15,224	1,324	2,427	1,181	1,204	727	1,257	*1,347*	2
18	3,139	1,719	2,177	6,055	1,324	3,034	1,181	1,204	727	1,257	1,439	3
19	2,563	1,627	2,177	4,294	1,324	*19,978*	1,072	1,204	727	1,257	*2,505*	1
20	2,272	1,761	2,137	3,423	1,324	7,525	1,072	1,204	727	1,257	1,607	1

Daily discharge, in second-feet, of Schuylkill River at Fairmount dam, near Philadelphia, Pa., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	2,207	3,167	2,097	2,925	1,324	4,279	1,072	1,296	727	3,165	1,354	2,864
22	2,207	*16,053*	2,097	2,740	1,324	4,279	1,095	1,296	727	2,581	1,347	2,944
23	2,207	10,279	1,957	2,586	1,324	4,885	1,072	1,296	727	1,349	1,347	2,711
24	4,121	5,470	*1,873*	2,399	1,324	4,679	1,072	1,204	727	1,282	1,347	2,631
25	3,044	4,558	1,873	2,286	1,324	3,069	1,072	1,204	727	1,349	1,347	3,383
26	2,707	6,325	2,097	1,994	1,324	2,011	1,072	1,204	727	1,713	1,347	*1,422*
27	2,482	4,369	4,349	1,906	*1,324*	1,754	1,072	1,209	727	1,257	1,347	1,422
28	2,818	3,225	9,798	1,838	6,394	1,617	1,072	1,296	727	1,257	1,347	1,422
29	3,085	.....	7,031	1,766	*13,566*	1,462	1,551	1,204	727	1,257	1,347	1,422
30	2,614	.....	6,081	*1,722*	2,931	1,445	1,382	1,204	727	1,257	1,347	1,422
31	2,209	.....	5,946	.....	1,805	.....	1,072	1,204	.....	1,257	.....	*5,786*

NOTE.—Italic figures indicate maximum and minimum.

Monthly discharge of Schuylkill River at Fairmount dam, near Philadelphia, Pa., for 1906.

[Drainage area, 1,920 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	7,810	1,690	3,010	1.57	1.81
February	16,100	1,630	3,280	1.71	1.78
March	27,000	1,870	4,920	2.56	2.95
April	16,200	1,720	4,880	2.54	2.83
May	13,600	1,320	2,010	1.05	1.21
June	20,000	1,260	2,780	1.45	1.62
July	5,490	1,070	1,310	.682	.79
August	10,100	1,200	1,640	.854	.98
September	1,210	727	753	.392	.44
October	4,260	1,260	1,510	.786	.91
November	2,500	1,350	1,400	.729	.81
December	5,790	1,420	1,890	.984	1.13
The year	27,000	727	2,450	1.28	17.26

PERKIOMEN CREEK AT FREDERICK, PA.

Measurements of this creek were begun on August 20, 1884. The station is located at Frederick, about 12 miles above the mouth, and also above two large tributaries known as West Swamp Creek and Northeast Branch of Perkiomen. Both of these tributaries have been measured, the first at Zieglerville and the second at Schwenkville. The records of daily discharge for 1906 have been furnished by John E. Codman. The conditions at the station are described in Water-Supply Paper No. 166, page 93, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Perkiomen Creek at Frederick, Pa., for 1906

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	151.5	168.0	198.0	394.0	119.5	146.0	91.5	62.5	57.2	*33.5*	281.6
2	*137.5*	139.5	178.0	297.0	113.0	124.0	78.5	55.0	41.4	42.4	163.0
3	161.0	117.5	2,115.0	228.0	115.0	105.0	91.5	1,339.3	38.3	47.8	113.5
4	*1,512.0*	108.0	4,054.4	207.0	111.5	83.5	*421.5*	*1,690.5*	45.8	51.9	76.5
5	648.8	92.0	557.5	200.0	102.0	75.0	193.5	241.5	44.3	213.5	61.0
6	356.0	92.0	382.5	212.0	104.0	75.0	112.2	93.0	42.7	197.5	58.0
7	180.8	*86.0*	318.5	202.0	116.5	82.5	83.5	101.5	42.7	77.0	58.0
8	193.0	86.0	311.0	176.0	114.5	89.5	71.0	88.5	42.7	58.0	58.0
9	178.0	106.0	301.5	1,190.4	113.5	82.0	67.5	106.5	34.5	58.0	58.0
10	192.0	121.0	262.5	*3,026.6*	117.5	79.5	71.5	106.0	26.3	58.0	46.7
11	171.0	110.0	223.5	687.3	105.5	76.0	67.5	84.0	*26.3*	50.9	*23.7*
12	218.5	104.5	203.0	422.0	96.0	63.0	59.0	71.0	90.2	43.7	75.0
13	314.2	117.5	178.0	326.5	83.5	51.9	54.9	58.0	*292.0*	42.2	83.5
14	244.5	170.2	163.0	276.0	75.0	*48.3*	59.5	55.0	91.8	35.8	63.5
15	257.0	217.5	168.0	2,583.3	75.0	50.7	93.0	48.9	43.7	38.3	63.5
16	581.0	172.0	188.0	1,109.5	76.5	54.3	55.3	44.7	40.6	45.8	75.0
17	452.0	144.0	196.0	431.0	71.5	69.0	46.8	40.6	30.9	38.4	79.5
18	290.0	104.5	140.0	332.5	68.0	775.2	62.5	39.1	30.9	36.3	294.7
19	252.5	128.5	166.0	286.5	64.0	*2,195.2*	61.4	35.8	45.6	47.3	*778.5*
20	216.0	224.7	183.0	202.0	58.0	441.5	51.3	*28.6*	40.9	153.4	263.0
21	154.5	1,498.1	178.0	227.5	54.9	232.0	51.9	63.6	26.3	240.5	200.5
22	168.5	*2,165.3*	157.5	208.5	54.3	301.5	51.9	88.0	30.9	202.0	221.2
23	249.0	480.7	129.0	195.0	51.3	247.0	43.3	60.4	33.0	148.0	184.2
24	688.8	328.0	133.5	190.0	45.8	248.0	83.2	83.2	28.6	121.5	128.2
25	312.0	592.3	*118.5*	170.0	50.0	177.5	83.2	49.3	42.1	*509.0*	88.0
26	214.0	599.8	153.5	157.0	*44.9*	124.0	46.3	46.7	70.9	352.5	75.0
27	188.0	258.0	1,379.2	143.0	51.2	106.0	46.8	77.7	34.0	191.5	75.0
28	492.7	182.0	1,999.8	129.0	*1,864.6*	99.0	*38.6*	170.7	26.3	132.5	75.0
29	286.0	.....	1,206.0	*117.5*	1,543.3	85.5	63.8	111.0	26.3	119.5	60.4
30	190.0	.....	530.5	119.5	299.3	92.5	101.5	71.0	26.3	106.0	44.7
31	168.0	.....	745.5	.....	183.0	.....	93.0	62.5	.....	109.5	.....

NOTE.—Italic figures indicate maximum and minimum.

Monthly discharge of Perkiomen Creek at Frederick, Pa., for 1906.

[Drainage area 152 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
January	1,510	138	317	2.09	
February	2,170	86.0	311	2.05	
March	4,050	118	555	3.65	
April	3,030	118	480	3.16	
May	1,860	44.9	198	1.30	
June	2,200	48.3	216	1.42	
July	422	38.6	83.8	.551	
August	1,690	28.6	170	1.12	
September	292	26.3	49.8	.328	
October	509	33.5	116	.763	
November	778	28.7	131	.862	
December	3,360	44.7	287	1.89	
The year	4,050	26.3	243	1.60	

WISSAHICKON CREEK NEAR PHILADELPHIA, PA.

Wissahickon Creek is the principal stream draining into Schuyl River from the north below Perkiomen Creek. The records of d discharge for 1906, as furnished by John E. Codman, are given in following table:

ischarge, in second-feet, of Wissahickon Creek near Philadelphia, Pa., for 1906.

[Drainage area, 64.6 square miles.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
.....	63.8	41.8	41.8	157.5	68.3	54.7	46.8
.....	54.2	33.7	*32.3*	173.0	61.5	16.8	18.7
.....	92.3	26.1	1,010.5	102.0	56.2	9.3	19.3
.....	*437.5*	22.3	*1,121.9*	95.9	52.3	7.3	*887.9*
.....	215.3	22.3	205.7	102.0	48.6	7.0	219.4
.....	131.7	21.7	91.7	98.7	48.6	10.0	72.9
.....	111.2	*21.7*	142.0	91.2	47.3	13.2	72.9
.....	105.4	34.8	141.5	91.3	44.6	13.5	63.8
.....	82.1	69.3	131.5	*628.7*	44.6	16.9	47.4
.....	68.4	93.6	121.3	598.0	44.6	17.4	47.4
.....	63.8	95.9	114.6	197.5	41.9	10.2	47.4
.....	101.9	95.9	104.4	166.2	37.8	7.0	23.8
.....	128.2	187.8	95.3	140.3	35.0	7.7	16.0
.....	152.4	386.8	93.6	114.6	32.3	6.3	15.4
.....	161.3	*417.7*	93.6	475.6	29.6	*3.1*	15.8
.....	137.0	128.3	91.3	205.0	28.2	229.2	19.2
.....	128.1	89.5	79.8	140.0	28.2	236.5	205.5
.....	111.2	72.9	77.5	131.5	22.2	848.1	191.9
.....	102.7	57.4	86.7	123.1	*21.6*	*1,096.5*	42.5
.....	97.6	52.8	104.9	118.0	22.2	213.7	18.9
.....	101.0	101.9	114.5	112.9	22.8	148.7	69.9
.....	106.1	289.0	102.6	109.5	22.8	158.0	115.4
.....	89.5	89.5	95.3	111.0	22.8	219.0	58.8
.....	68.4	89.5	89.0	95.9	22.8	323.7	23.2
.....	63.8	140.5	99.8	91.3	22.8	140.3	12.7
.....	52.8	221.9	136.3	84.4	22.8	104.8	*11.7*
.....	*39.1*	88.4	499.6	79.8	64.4	70.2	50.1
.....	105.7	56.9	334.7	77.5	*148.9*	59.2	47.6
.....	143.9	.....	156.5	75.2	148.9	54.6	57.3
.....	81.1	.....	129.7	*72.9*	22.8	63.7	106.1
.....	47.3	.....	185.1	.....	54.7	.....	85.0

m drained out and observations discontinued after July. Italic figures indicate maxi-
inimum.

thly discharge of Wissahickon Creek near Philadelphia, Pa., for 1906.

[Drainage area, 64.6 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	438	39.1	111	1.72	1.98
.....	418	21.7	109	1.69	1.76
.....	1,120	32.3	94.4	1.46	1.68
.....	629	72.9	162	2.51	2.80
.....	149	21.6	44.9	.695	.80
.....	1,100	3.1	139	2.15	2.40
.....	888	11.7	88.1	1.36	1.57

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CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 202.]

The publications of the United States Geological Survey consist of (1) Annual Reports; (2) Monographs; (3) Professional Papers; (4) Bulletins; (5) Mineral Resources; (6) Water-Supply and Irrigation Papers; (7) Topographic Atlas of United States, folios and separate sheets thereof; (8) Geologic Atlas of United States, folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists can be had on application.

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1888. Tenth Annual Report, Part II*.
1889. Eleventh Annual Report, Part II*.
1890. Twelfth Annual Report, Part II*.
1891. Thirteenth Annual Report, Part III*.
1892. Fourteenth Annual Report, Part II*.
1893. Bulletin No. 131*.
1894. Bulletin No. 131*; Sixteenth Annual Report, Part II*.
1895. Bulletin No. 140*.
1896. Water-Supply Paper No. 11*; Eighteenth Annual Report, Part IV*.
1897. Water-Supply Papers Nos. 15* and 16*; Nineteenth Annual Report, Part IV*.
1898. Water-Supply Papers Nos. 27* and 28*; Twentieth Annual Report, Part IV*.
1899. Water-Supply Papers Nos. 35*, 36*, 37*, 38*, and 39*; Twenty-first Annual Report, Part IV*.
1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.
1901. East of Mississippi River, Water-Supply Papers Nos. 65* and 75*.
West of Mississippi River, Water-Supply Papers Nos. 66 and 75*.

1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.
1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, a
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, a
1905. East of Mississippi River, Water-Supply Papers Nos. 165*, 166* 167, 168*, 169
West of Mississippi River, Water-Supply Papers Nos. 171, 172*, 173*, 174, 175*
1906. East of Mississippi River, Water-Supply Papers Nos. 201, 202, 203, 204, 205, 20
West of Mississippi River, Water-Supply Papers Nos. 207, 208, 209, 210, 211, 2

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SEPTEMBER, 1907.

O

Supply and Irrigation Paper No. 203 Series P, Hydrographic Progress Reports, 57

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY
OF
MIDDLE ATLANTIC STATES, 1906

(SUSQUEHANNA, GUNPOWDER, PATAPSCO, POTOMAC, JAMES, ROANOKE, AND YADKIN RIVER DRAINAGES)

N. C. GROVER
DISTRICT HYDROGRAPHER

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

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1905. East of Mississippi River, Water-Supply Papers Nos. 165*, 166* 167, 168*, 169, 170, and 171.
West of Mississippi River, Water-Supply Papers Nos. 171, 172*, 173*, 174, 175*, 176, 177, and 178.
1906. East of Mississippi River, Water-Supply Papers Nos. 201, 202, 203, 204, 205, 206, and 207.
West of Mississippi River, Water-Supply Papers Nos. 207, 208, 209, 210, 211, 212, 213, and 214.

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FACE WATER SUPPLY OF THE MIDDLE ATLANTIC STATES, 1906.[a]

N. C. GROVER,

District hydrographer.[b]

INTRODUCTION.

SCOPE OF WORK.

ıe water supply of the United States is of more importance to the ınd pursuits of the people than any other natural resource. In ırid States the limit of agricultural development is determined by amount of water available for irrigation, while in all parts of the ıtry the increase in the population of cities and towns makes necry additional water supplies for domestic and industrial uses, in uring which both the quantity and the quality of the water that be obtained must be considered. The location of manufacturing ıts may depend largely on the water-power facilities and on the acter of the water. The notable advances made in the electric smission of power have led to the utilization of water powers for operation of manufacturing establishments, railroads, and municilighting plants, many of which are at some distance from the es at which the power is developed.

he intelligent establishment and maintenance of enterprises or ıstries that depend on the use of water demands a thorough wledge of the flow of the streams and an understanding of the conons affecting that flow. This knowledge should be based on data ving both the total flow and the distribution of the flow throughthe year, in order that normal fluctuations may be provided for. the flow of a stream is variable from year to year, estimates of ıre flow can be made only from a study of observations covering eral years. The rapid increase in the development of the water

his report contains information similar to that published for previous years under the title "Report ogress of Stream Measurements."

he data presented in this report have been collected by local hydrographers, mostly under the direcof N. C. Grover. They have been prepared for publication under the direction of John C. Hoyt, and tance has been given both in the field and in the office by R. H. Bolster, Robert Follansbee, F. F. shaw, H. D. Padgett, and J. E. Stewart.

resources of the United States has caused a great demand by engine for information in regard to the flow of streams, as it is now gener realized that the failure of many large power, irrigation, and ot projects has been due to the fact that the plans were made with sufficient trustworthy information in respect to the water supply.

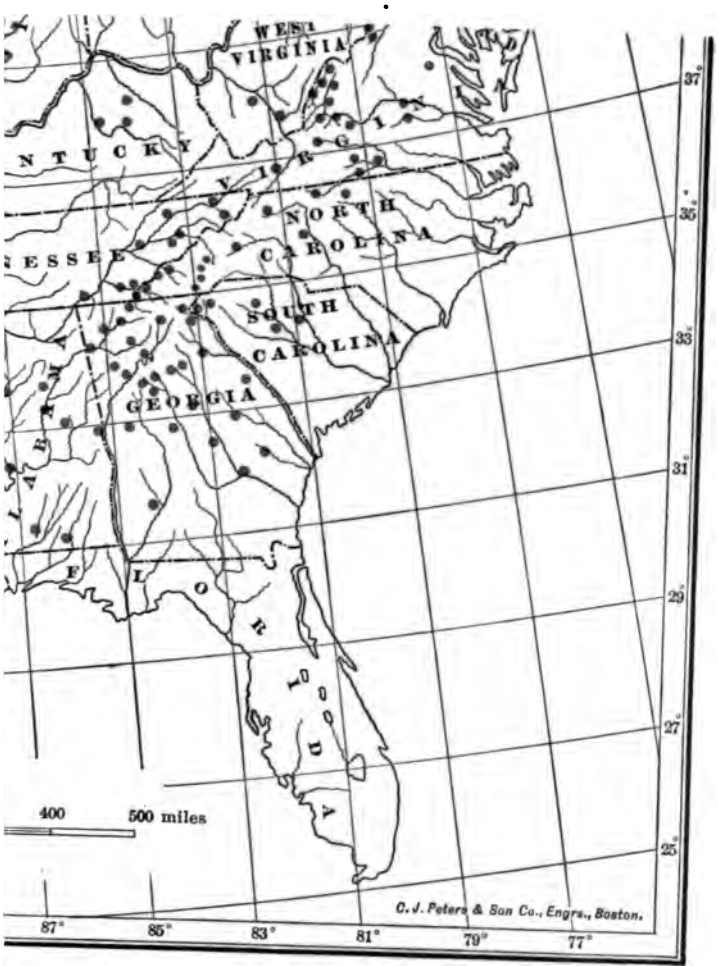
Owing to the broad scope of these hydrographic investigations a the length of time they should cover in order that the records may of greatest value, it is in general impossible for private individuals collect the necessary data, and as many of the streams traverse m than one State this work does not properly fall within the provinc the State authorities. The United States Geological Survey h therefore, by means of specific appropriations by Congress, for sev years systematically made records of stream flow, with the view ultimately determining all the important features governing the f of the principal streams of the country. In carrying out this p stations are established on the streams and maintained for a pe long enough to show their regimen or general behavior. Whe record that is sufficient for this purpose has been obtained for t stream, the work on that stream is discontinued. The order which the streams are measured is determined by the degree of t importance.

During 1906 the regimen of flow was studied at about 700 stat distributed along the various rivers throughout the United States shown on Pl. I. In addition to these records data in regard to cipitation, evaporation, water power, and river profiles were obta in many sections of the country.

These data have been assembled by drainage areas and are p lished in a series of fourteen Water-Supply and Irrigation Pap Nos. 201 to 214, inclusive, each of which pertains to the surface w resources of a group of adjacent areas. In these papers are embod not only the data collected in the field, but also the results of com tations based on these data and other information that has a di bearing on the subject, such as descriptions of basins and the stre draining them, utility of the water resources, etc. The list follows

Water-Supply and Irrigation Papers on surface water supply, 1906.

201. Surface water supply of New England, 1906. (Atlantic coast of New Eng drainage.)
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river d ages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, C powder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1 (Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Me drainages.)
205. Surface water supply of the Ohio and lower eastern Mississippi river draina *1906.*


WEST
VIRGINIA
NORTH
CAROLINA
SOUTH
CAROLINA
GEORGIA
400
500 miles
C. J. Peters & Son Co., Engrs., Boston.
37°
35°
33°
31°
29°
27°
25°
87°
85°
83°
81°
79°
77°

ING 1906.

resources of the United States has caused a great demand by engine for information in regard to the flow of streams, as it is now gener realized that the failure of many large power, irrigation, and ot projects has been due to the fact that the plans were made with sufficient trustworthy information in respect to the water supply.

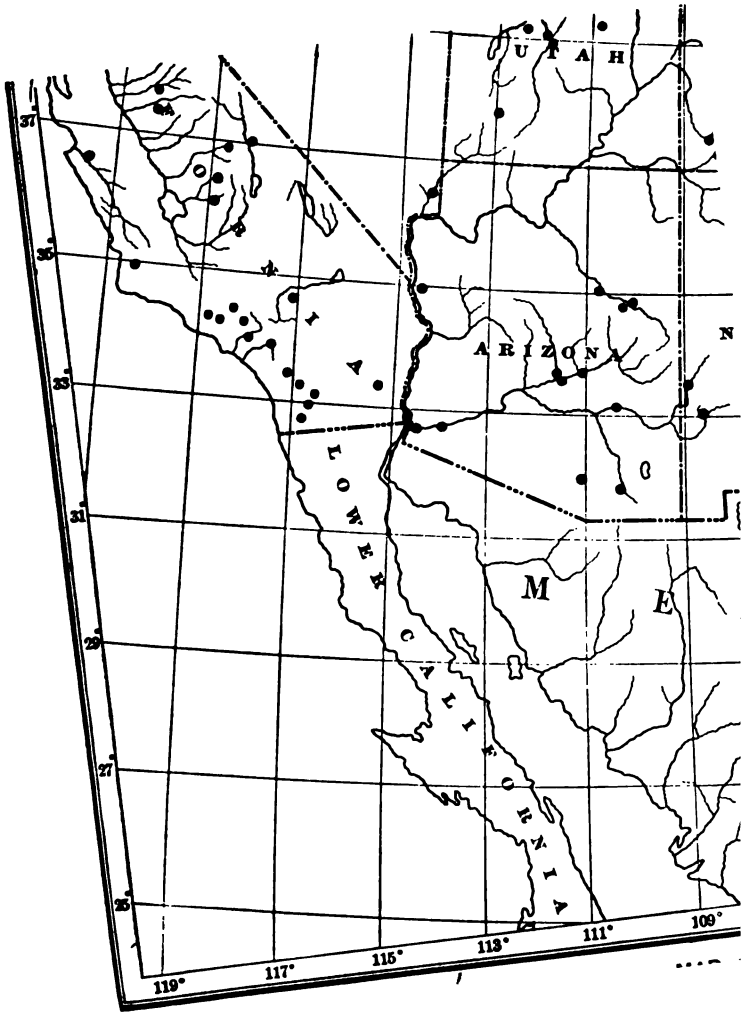
Owing to the broad scope of these hydrographic investigations a the length of time they should cover in order that the records may of greatest value, it is in general impossible for private individuals collect the necessary data, and as many of the streams traverse m than one State this work does not properly fall within the provinc the State authorities. The United States Geological Survey h therefore, by means of specific appropriations by Congress, for sev years systematically made records of stream flow, with the view ultimately determining all the important features governing the f of the principal streams of the country. In carrying out this p stations are established on the streams and maintained for a per long enough to show their regimen or general behavior. Whe record that is sufficient for this purpose has been obtained for a stream, the work on that stream is discontinued. The order which the streams are measured is determined by the degree of t importance.

During 1906 the regimen of flow was studied at about 700 stati distributed along the various rivers throughout the United States shown on Pl. I. In addition to these records data in regard to p cipitation, evaporation, water power, and river profiles were obtai in many sections of the country.

These data have been assembled by drainage areas and are p lished in a series of fourteen Water-Supply and Irrigation Pap Nos. 201 to 214, inclusive, each of which pertains to the surface wa resources of a group of adjacent areas. In these papers are embod not only the data collected in the field, but also the results of com tations based on these data and other information that has a di bearing on the subject, such as descriptions of basins and the strea draining them, utility of the water resources, etc. The list follows

Water-Supply and Irrigation Papers on surface water supply, 1906.

201. Surface water supply of New England, 1906. (Atlantic coast of New Engl drainage.)
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river dr ages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, (powder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1 (Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Me drainages.)
205. Surface water supply of the Ohio and lower eastern Mississippi river draina *1906.*


UTAH
ARIZONA
LOWER CALIFORNIA
M
E
37°
35°
33°
31°
29°
27°
25°
119°
117°
115°
113°
111°
109°

206. Surface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
207. Surface water supply of the upper Mississippi River and Hudson Bay drainages, 1906.
208. Surface water supply of the Missouri River drainage, 1906.
209. Surface water supply of the lower western Mississippi River drainage, 1906.
210. Surface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
211. Surface water supply of the Colorado River drainage above Yuma, 1906.
212. Surface water supply of the Great Basin drainage, 1906.
213. Surface water supply of California, 1906. (The Great Basin and Pacific Ocean drainages in California and Colorado River drainage below Yuma.)
214. Surface water supply of the North Pacific Coast, 1906.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing such records up to and including 1903 has been published in Water-Supply Paper No. 119. The following table gives, by years and primary drainage basins, the numbers of the papers on surface water supply published from 1901 to 1906:

Numbers of Water-Supply Papers containing results of stream measurements, 1901–1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
Atlantic coast of New England drainage	65 75	82	97	124	165	201
Hudson, Passaic, Raritan, and Delaware river drainages	65 75	82	97	125	166	202
Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages	65 75	82 83	97 98	126	167	203
Santee, Savannah, Ogeechee, and Altamaha rivers and eastern Gulf of Mexico drainages	65 75	83	98	127	168	204
Ohio and lower eastern Mississippi river drainages	65 75	83	98	128	169	205
Great Lakes and St. Lawrence River drainages	65	83	97	129	170	206
Hudson Bay and upper eastern and western Mississippi River drainages	65 66 75	83 84 85	98 99 100	128 130	171	207
Missouri River drainage	66 75	84	99	130 131	172	208
Meramec, Arkansas, Red, and lower western Mississippi river drainages	66 75	84	99	131	173	209
Western Gulf of Mexico and Rio Grande drainages	66 75	84	99	132	174	210
Colorado River drainage, above Yuma	66 75	85	100	133	175	211
The Great Basin drainage	66 75	85	100	133	176	212
The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage, below Yuma	66 75	85	100	134	177	213
North Pacific Coast drainage	66 75	85	100	135	178	214

[a] Reports containing data for years prior to 1901 are noted in the series list at the end of this paper.

DEFINITIONS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water,

as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot: One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.
6. Tables showing discharge and horsepower and the number of days during the year when the same are available.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station, and they also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of the

hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. At most stations the gage is read in the morning and in the evening.

The discharge measurements and gage heights are the base data from which the other tables are computed. In cases of extensive development it is expected that engineers will use these original data in making their calculations, as the computations made by the Survey are based on the data available at the time they are made and should be reviewed and, if necessary, revised when additional data are available.

The rating table gives the discharge in second-feet corresponding to various stages of the river as given by the gage heights. It is published to enable engineers to determine the daily discharge in case this information is desired.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest, and it is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. Upon this the computations for the remaining columns, which are defined on page 4, are based.

The values in the table of monthly discharge are intended to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

In most work where data in regard to flow are used the regimen of flow is of primary importance. Therefore for the principal stations tables have been prepared showing the horsepower that can be developed at various rates of flow, and the length of time that these rates of flow and the corresponding horsepower are available. These tables have been prepared on a basis of 80 per cent efficiency on the turbines, and the horsepower per foot of fall is given in order that the reader can determine the horsepower for any fall.

In the computations sufficient significant figures have been used so that the percentage of error in the tables will not in general exceed 1 per cent. Therefore, most of the values in the tables are given to only three significant figures. In making the various computations Thatcher's slide rule, Crelle's tables, and computation machines have been *generally used.*

In order to give engineers an idea of the relative value of the various data notes in regard to accuracy are given as far as possible. This accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data.

In the accuracy notes the following terms have been used, indicating the probable accuracy, in per cent, of the mean monthly flow. As these values are mean values, the error in the value for the flow of any individual day may be much larger.

Excellent indicates that the mean monthly flow is probably accurate to within 5 per cent; good, to within 10 per cent; fair, to within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.*
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equal 18.7 United States gallons per second.
100 California miner's inches equal 96.0 Colorado miner's inches.
100 California miner's inches for one day equal 4.96 acre-feet.
100 Colorado miner's inches equal 2.60 second-feet.
100 Colorado miner's inches equal 19.5 United States gallons per second.
100 Colorado miner's inches equal 104 California miner's inches.
100 Colorado miner's inches for one day equal 5.17 acre-feet.
100 United States gallons per minute equal 0.223 second-feet.
100 United States gallons per minute for one day equal 0.442 acre-foot.
1,000,000 United States gallons per day equal 1.55 second-feet.
1,000,000 United States gallons equal 3.07 acre-feet.
1,000,000 cubic feet equal 22.95 acre-feet.

1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equal about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel, realizing 80 per cent of theoretical power.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geol. Survey) and No. 95 (Accuracy of Stream Measurements). In order that those who use this report may readily become acquainted with the general methods employed, the following brief descriptions are given:

Streams may be divided, with respect to their physical conditions, into three classes: (1) Those with permanent beds; (2) those with beds which change only during extreme low or high water; and (3) those with constantly shifting beds. In determining the daily flow special methods are necessary for each class. The data on which the determinations are based and the methods of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir, (3) by measurements of the velocity of the current and of the area of the cross section. The method chosen for any case depends on the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v = c\sqrt{Rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values *of the coefficient* n which appears therein. The

results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir method.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable measurements of flow. The conditions necessary to insure good results may be divided into two classes: (1) Those relating to the physical characteristics of the dam itself, and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q = c\ b\ h^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Papers Nos. 180 and 200[a]); (*f*) either no flashboards or exceptional care in reducing leakage through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, the dam is built for purposes of power or navigation, and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such determinations of flow, the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured, either by a weir, a current meter, or a simple system of water wheels which are of standard make, or which have been rated as meters under working conditions and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the determinations of flow will not involve, for a critical stage of considerable duration, the use of a head on a broad-crested dam of less than 6 inches. Moreover, when all other conditions are good, the cooperation of the owners or operators of the plant is still essential if reliable results are to be obtained.

[a] Water-Supply Paper No. 200 replaces No. 150, the edition of which has been exhausted.

A gaging station at a weir or dam has the general advantage of continuity of record through the period of ice and floods and the disadvantages of uncertainty of coefficient to be used in the weir formula and of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water flowing past a certain section of a stream at a given time is termed a discharge measurement. This quantity is the product of two factors—the mean velocity and the area of the cross section. The mean velocity is a function of surface slope, wetted perimeter, roughness of bed, and the channel conditions at, above, and below the gaging section. The area depends on the contour of the bed and the fluctuations of the water surface. The two principal ways of measuring the velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging stations for determining discharge by velocity measurements, in order that the data may have the required degree of accuracy. Their essential requirements are practically the same, whether the velocity is determined by meters or floats. They are located, as far as possible, where the channel is straight both above and below the gaging section; where there are no cross currents, backwater, or boils; where the bed of the stream is reasonably free from large projections of a permanent character, and where the banks are high and subject to overflow only at flood stages. The station must be so far removed from the effects of tributary streams and of dams or other artificial obstructions that the gage height shall be an index of the discharge.

Certain permanent or semipermanent structures, usually referred to as "equipment," are generally pertinent to a gaging station. These are a gage for determining the fluctuations of the water surface, bench marks to which the datum of the gage is referred, permanent marks on a bridge or a tagged line indicating the points of measurement, and, where the current is swift, some appliance (generally a secondary cable) to hold the meter in position in the water. As a rule the stations are located at bridges if the channel conditions are satisfactory, as from them the observations can more readily be made and the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In case of flood measurements good results can be obtained by observing the velocity of floating cakes of ice or débris. In case of all surface-float measurements coefficients must be used to reduce the observed velocity to the mean velocity. The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

In measuring velocity by a float, observation is made of the tir taken by the float to pass over the "run," a selected stretch of riv from 50 to 200 feet long. In each discharge measurement a larg number of velocity determinations are made at different points acro the stream, and from these observations the mean velocity for th whole section is determined. This may be done by plotting the mea positions of the floats, as indicated by the distances from the bank, a ordinates and the corresponding times as abscissas. A curve through these points shows the mean time of run at any point across th stream, and the mean time for the whole stream is obtained b dividing the area bounded by this curve and its axis by the width The length of the run divided by the mean time gives the mea velocity.

The area used in float measurements is the mean of the areas at th two ends of the run and at several intermediate sections.

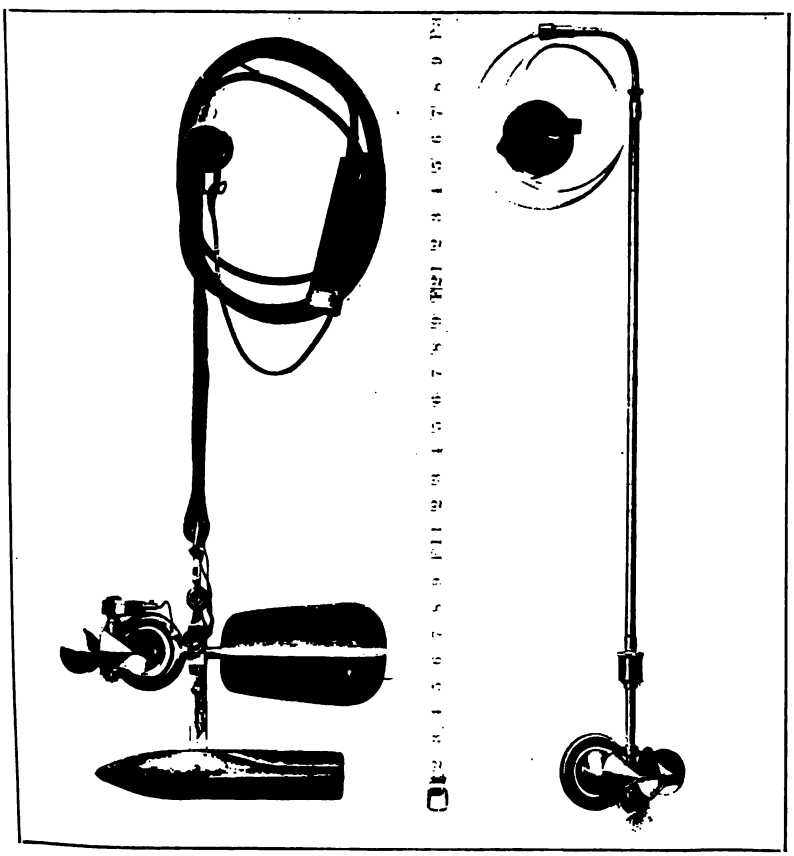
The essential parts of the current meters in use are a wheel of som type, so constructed that the impact of flowing water causes it t revolve, and a device for recording or indicating the number of revo lutions. The relation between the velocity of the moving water an the revolutions of the wheel is determined for each meter. This rat ing is done by drawing the meter through still water for a given dis tance at different speeds and noting the number of revolutions fo each run. From these data a rating table is prepared which give the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They may however, be classed in two general types—those in which the wheel i made up of a series of cups, as the Price, and those having a screw propeller wheel, as the Haskell. Each meter has been developed fo use under some special condition. In the case of the small Pric meter, shown in Pl. II, *B*, which has been largely developed an extensively used by the United States Geological Survey, an attemp has been made to get an instrument which could be used unde practically all conditions.

Current-meter measurements may be made from a bridge, cable boat, or by wading, and gaging stations may be classified in accord ance with such use. Fig. 1 shows a typical cable station.

In making the measurement an arbitrary number of points are lai off on a line perpendicular to the thread of the stream. The points a which the velocity and depth are observed are known as measurin points, and are usually fixed at regular intervals, varying from 2 to 2 feet, depending on the size and condition of the stream. Perpendicu lars dropped from the measuring points divide the gaging section int strips. For each strip or pair of strips the mean velocity, area, an discharge are determined independently, so that conditions existin

A. CURRENT-METER RATING STATION AT LOS ANGELES, CAL.



B. PRICE CURRENT METERS.

one part of the stream may not be extended to parts where they do ot apply.

Three classes of methods of measuring velocity with current meters re in general use—multiple-point, single-point, and integration.

The three principal multiple-point methods in general use are the vertical velocity-curve; 0.2 and 0.8 depth; and top, bottom, and mid-depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually from 0.5 to 1 foot apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve among the resulting points, the vertical velocity-curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the area bounded by this velocity-curve and its axis by the depth. On account of the length of time required to

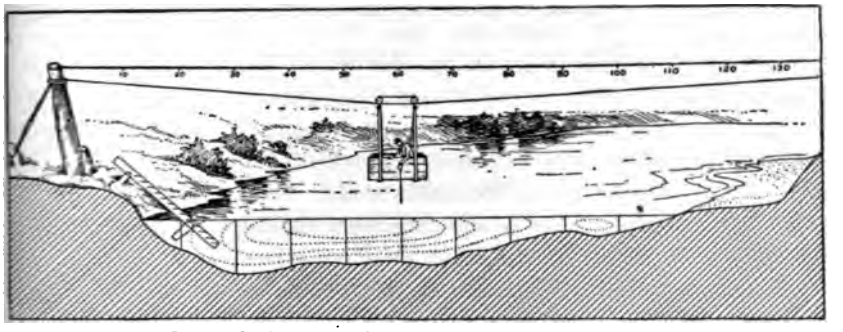


FIG. 1.—Cable station, showing section of river, car, gage, etc.

make a complete measurement by this method, its use is limited to the determination of coefficients for purposes of comparison and to measurements under ice.

In the second multiple-point method the meter is held successively at 0.2 and 0.8 of the depth, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. On the assumption that the vertical velocity-curve is a common parabola with horizontal axis, the mean of the velocities at 0.22 and 0.79 of the depth will give (closely) the mean velocity in the vertical. Actual observations under a wide range of conditions show that this second multiple-point method gives the mean velocity very closely for open-water conditions, and moreover the indications are that it holds nearly as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid-depth, at 0.5 foot below the surface, and at 0.5 foot above the bottom, and the mean velocity is determined by dividing by 6 the sum of the top

velocity, four times the mid-depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity, or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity-curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in a majority of the measurements. A large number of vertical velocity-curve measurements, taken on many streams and under varying conditions, show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of the wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is specially adapted for flood measurements, or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical-integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface, and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river, which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at various points of measurement, the measuring section is divided into elementary strips, as shown in fig. 1, and the *mean velocity, area,* and discharge are determined separately for either

ingle or a double strip. The total discharge and the area are the ms of those for the various strips, and the mean velocity is obtained dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, ing to diversity and instability of conditions during the winter eriod and also to lack of definite information in regard to the laws flow of water under ice. The method now employed is to make equent discharge measurements during the frozen periods by the 2 and 0.8, and vertical velocity-curve methods, and to keep an ccurate record of the conditions, such as the gage height to the surface f the water as it rises in a hole cut in the ice, the thickness and haracter of the ice, etc.

From these data an approximate estimate of the daily flow can be nade by constructing a rating curve (really a series of curves) similar o that used for open channels, but considering, in addition to gage eights and discharge, the varying thickness of ice. For information n regard to flow under ice cover see Water-Supply Paper No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

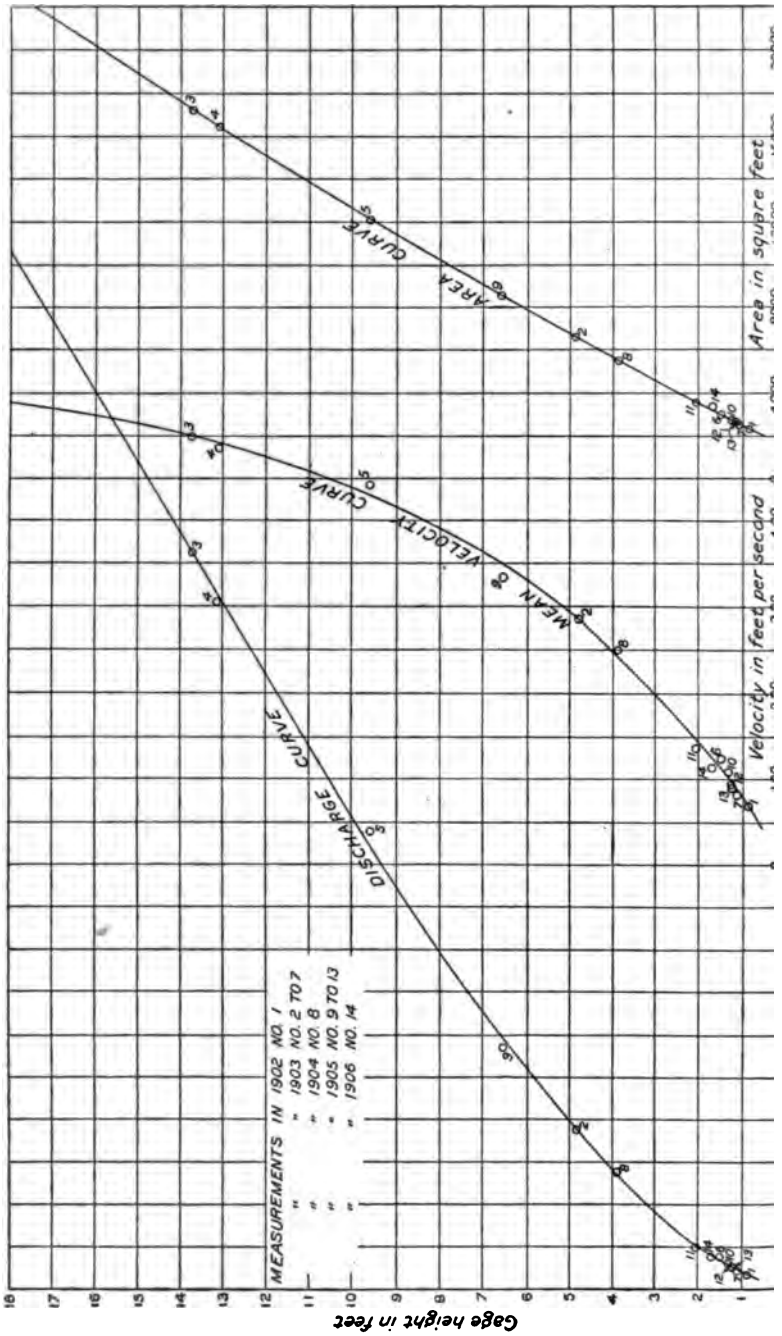
There are two principal methods of determining run-off, depending n whether or not the bed of the stream is permanent.

For stations on streams with permanent beds the first step in computing the run-off is the construction of a rating table, which shows the discharge corresponding to any stage of the stream. This rating able is applied to the record of stage to determine the amount of ater flowing. The construction of the rating table depends on the nethod used in measuring flow.

For a station at a weir or dam the basis for the rating table is some tandard weir formula. The coefficients to be used in its application epend on the type of dam and other conditions near its crest. After nserting in the weir formula the measured length of crest and the ssumed coefficient the discharge is computed for various heads and he rating table constructed.

The data necessary for the construction of a rating table for a elocity-area station are the results of the discharge measurements, hich include the record of stage of the river at the time of measurement, the area of the cross section, the mean velocity of the current, nd the quantity of water flowing. A thorough knowledge of the onditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends on the following laws f flow for open, permanent channels: (1) The discharge will remain onstant so long as conditions at or near the gaging station remain onstant; (2) the discharge will be the same whenever the stream is t a given stage if the change of slope due to the rise and fall of the ream be neglected; (3) the discharge is a function of and increases adually *with the stage.*


MEASUREMENTS IN 1902 NO. 1
" " 1903 NO. 2 TO 7
" " 1904 NO. 8
" " 1905 NO. 9 TO 13
" " 1906 NO. 14
DISCHARGE CURVE
MEAN OF VELOCITY CURVE
AREA CURVE
Gage height in feet
Velocity in feet per second
Area in square feet

The plotting of results of the various discharge measurements, using gage heights as ordinates, and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. For the development of these curves there should be, therefore, a sufficient number of discharge measurements to cover the range of the stage of the stream. Fig. 2 shows a typical rating curve with its corresponding mean-velocity and area curves.

As the discharge is the product of two factors, the area and the mean velocity, any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is always concave toward the horizontal axis or on a straight line, unless the banks of the stream are overhanging.

The form of the mean-velocity curve depends chiefly on the surface slope, the roughness of the bed, and the cross section of the stream. Of these, the slope is the principal factor. In accordance with the relative changes of these factors the curve may be either a straight line, convex or concave toward either axis, or a combination of the three. From a careful study of the conditions at any gaging station the form which the vertical velocity-curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth and half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, the discharge may be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the determinations of flow are to be other than rough approximations. For stations with beds which *shift slowly or are materially* changed only during floods

[illegible] such changes and [illegible] with a limited number of measurements, [illegible] after the change occurs. [illegible] such as the Colorado and [illegible] measurements should be made every two or [illegible] days obtained either by [illegible] by Professor Stout's method, [illegible] Nineteenth Annual Report of [illegible] Part IV, page 323, and in the [illegible] This method, or a graphical [illegible] the flow at stations [illegible]

[illegible] AND ACKNOWLEDGMENTS.

[illegible] furnished by the following, [illegible] The Maryland Geological [illegible] of the board of water commissioners, [illegible] chief engineer of the board of water [illegible] Hutchinson, chief engineer [illegible] C. A. Schenck, director of the [illegible]

MIDDLE ATLANTIC STATES DRAINAGES.

SUSQUEHANNA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Susquehanna River rises in Otsego Lake, in northern Otsego County, N. Y., at an elevation of 1,193 feet above tide, and flows in a general southerly direction into Chesapeake Bay. Its course is in many places extremely tortuous, crossing the State boundary between New York and Pennsylvania three times. The entire length of the river is about 500 miles, and it drains an area of 27,400 square miles, of which 21,060 square miles lie in Pennsylvania, 6,080 in New York, and 260 in Maryland.

The topography of the basin varies widely in character. In New York the stream and its tributaries flow through a rolling and in places rather broken country, bounded on the north by a mountainous area. In this part of the course its bed is of gravel or sand, with occasional rock ledges, and its banks are moderately high and not extensively subject to overflow. In Pennsylvania the river enters a mountain region, its banks are high, and it winds and twists among the parallel ranges in a bed composed generally of drift material, gravel, sand, and bowlders. In the lower part of its course from Marietta to Havre de Grace, it occupies a broad, deep valley

A

B

POWER-PLANT CONSTRUCTION.

A, On Susquehanna River near McCall Ferry, Pa.; *B*, On Shenandoah River near Millville, W. Va.

rying in width from a few hundred feet to more than a mile, and is r the most part bounded on either shore by rocky bluffs and table-nds elevated from 100 to 500 feet above its waters.

Above the mouth of the West Branch the fall of the stream is uni-rm and gradual; below that point the fall becomes more irregular, nd there are at many places rapids where the stream flows over a cky bottom. The elevation of the river at the mouth of the West ranch is 400 feet above mean sea level at Havre de Grace, the dis-nce between the two points being 125 miles. The slope is, however, xtremely variable.

The fall in the lower part of the river offers exceptional oppor-nities for power developments, the value of which is greatly en-nced by their proximity to an unlimited market in the adjacent rge cities. The hydrographic investigations of the Geological Sur-y along Susquehanna River have been of great assistance to engi-ers in investigating these powers. Pl. III, *A*, shows the construc-on at McCall Ferry, where the McCall Ferry Power Company is veloping a large power plant. In estimating for this development e records of the Geological Survey played an important part.

In early days a complete system of canals was built along the river om the New York State line to the bay, but these have been aban-oned with the establishment of railroads. The head of navigation is t the fall line, near the mouth of the stream, but various stretches are vigable for flatboats.

All available hydrographic data for Susquehanna River basin prior o 1905 have been collected and published in Water-Supply and Irri-ation Papers Nos. 108 and 109. No. 108 treats principally of the uality of the water, and No. 109 gives in detail information relative o fluctuations in stage and quantity of water flowing.

SUSQUEHANNA RIVER AT BINGHAMTON, N. Y.

This station was established July 31, 1901. It is located at the ashington Street Bridge, about 800 feet upstream from the junction f Chenango and Susquehanna rivers. The conditions at this station nd the bench marks are described in Water-Supply Paper No. 167, ge 17, where are given also references to publications that contain ata for previous years.

Discharge measurements of Susquehanna River at Binghamton, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
y 24	C. C. Covert	207	1,260	2.33	1,670
tober 5	do	298	1,100	1.98	732
vember 9	do	305	1,210	2.25	1,070

Daily gage height, in feet, of Susquehanna River at Binghamton, N. Y., for 19

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.62	3.3	3.1	8.12	2.91	4.0	3.12	2.08	2.2	1.98	2.75
2	3.28	3.02	3.08	6.42	2.91	3.65	3.66	2.08	2.2	2.02	2.65
3	2.95	2.72	3.0	5.45	3.46	3.33	3.26	2.1	2.15	2.02	2.6
4	3.08	2.72	6.9	5.27	5.01	3.17	2.99	2.22	2.15	2.0	2.45
5	4.02	2.62	9.3	6.45	4.31	3.0	2.79	2.08	2.1	2.0	2.4
6	4.45	2.82	6.35	7.59	3.78	3.85	2.74	2.0	2.12	2.0	2.32
7	3.55	2.85	4.6	6.72	3.58	4.23	2.44	2.0	2.1	1.95	2.28
8	3.1	2.68	4.1	5.82	3.44	3.75	2.41	2.78	2.1	2.0	2.25
9	2.88	2.55	3.75	5.42	3.28	3.15	2.36	2.38	2.02	2.02	2.22
10	2.72	2.62	3.6	7.12	3.21	3.45	2.42	2.22	2.05	1.98	2.2
11	2.88	2.68	3.5	9.35	3.28	4.05	2.64	2.15	2.02	2.0	2.22
12	2.8	2.98	3.18	8.49	3.14	4.3	2.54	2.05	1.9	1.98	2.32
13	3.0	2.42	3.08	7.19	3.01	3.55	2.42	2.05	1.9	1.98	2.4
14	3.2	2.45	2.92	6.47	2.98	3.13	2.29	2.02	.....	1.92	2.42
15	3.08	2.48	2.88	8.92	3.06	2.86	2.23	1.98	1.85	2.0	2.4
16	2.95	2.45	2.67	9.64	2.95	2.86	2.08	1.95	1.88	2.0	2.42
17	2.92	2.52	2.79	9.14	2.9	3.64	2.13	1.92	1.88	2.0	2.3
18	3.1	2.52	2.72	6.54	3.0	4.22	2.28	1.9	1.9	1.98	2.45
19	3.05	2.38	2.67	5.58	3.03	4.86	2.31	1.85	1.75	2.0	5.18
20	2.85	2.35	2.47	5.01	2.85	4.42	2.31	1.9	1.8	4.25	6.1
21	2.98	2.45	2.67	4.61	2.7	3.86	2.28	2.0	1.85	3.8	5.32
22	4.75	4.0	2.85	4.36	2.5	3.39	2.23	2.28	1.92	3.6	5.12
23	7.55	5.8	2.85	4.44	2.47	3.06	2.15	2.3	1.92	3.0	4.88
24	9.6	5.32	2.42	4.26	2.43	2.96	2.33	2.45	1.92	2.62	4.2
25	8.1	5.2	2.39	3.88	2.4	2.82	2.21	2.28	2.02	2.5	3.65
26	5.95	5.78	2.42	3.56	2.85	2.69	2.21	2.15	2.08	2.58	3.45
27	4.8	5.18	3.59	3.36	4.43	2.56	2.16	2.38	2.02	2.52	3.28
28	4.32	3.6	9.72	3.16	7.55	2.44	2.05	2.55	1.95	2.7	3.2
29	3.95	.....	9.35	3.04	7.7	2.56	2.08	3.15	1.95	2.68	3.22
30	3.62	.....	7.17	2.94	5.9	2.64	2.12	2.82	1.9	2.6	3.1
31	3.4	.....	9.42	.....	4.7	.....	2.05	2.55	.....	2.62	.....

NOTE.—River seldom freezes over at the gage. There is considerable anchor ice during Jan February and parts of March and December.

Rating table for Susquehanna River at Binghamton, N. Y., for 1901 to 190

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.75	210	3.00	3,025	4.30	6,300	6.20	12,040
1.80	315	3.10	3,265	4.40	6,570	6.40	12,680
1.90	525	3.20	3,505	4.50	6,845	6.60	13,320
2.00	740	3.30	3,755	4.60	7,125	6.80	13,960
2.10	960	3.40	4,005	4.70	7,405	7.00	14,600
2.20	1,180	3.50	4,255	4.80	7,690	7.20	15,260
2.30	1,400	3.60	4,505	4.90	7,980	7.40	15,920
2.40	1,625	3.70	4,755	5.00	8,280	7.60	16,590
2.50	1,855	3.80	5,005	5.20	8,880	7.80	17,270
2.60	2,085	3.90	5,255	5.40	9,495	8.00	17,950
2.70	2,315	4.00	5,510	5.60	10,120	9.00	21,500
2.80	2,545	4.10	5,770	5.80	10,760	10.00	25,100
2.90	2,785	4.20	6,030	6.00	11,400		

NOTE.—The above table is applicable only for open-channel conditions. It is based on di measurements made during 1901-1906. It is well defined between gage heights 2 feet and 5 fe upper part of the curve is based on one measurement at 16.3 feet.

Monthly discharge of Susquehanna River at Binghamton, N. Y., for 1906.

[Drainage area, 2,400 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches
January	23,700	2,360	5,720	2.38	2.74
February	10,800	1,510	3,740	1.56	1.62
March	24,000	1,000	6,790	2.83	3.26
April	23,800	2,880	11,500	4.79	5.34
May	16,900	1,620	4,560	1.90	2.19
June	7,840	1,720	4,070	1.70	1.90
July	4,660	850	1,710	.712	.82
August	3,380	420	1,220	.508	.59
September	1,180	210	705	.294	.33
October	6,160	567	1,580	.658	.76
November	11,700	1,180	3,470	1.45	1.62
December	11,800	1,810	4,380	1.82	2.10
The year	24,000	210	4,120	1.72	23.27

NOTE.—Values for January, February, March, and December are probably slightly in excess of the true values owing to anchor ice. Values for January to March and September and December are good. Values for April to August, and October, and November are excellent.

The following table gives the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge and shows the number of days on which the flow and the corresponding horsepower were respectively less than the amounts given in the columns for "discharge" and "horsepower:"

Discharge and horsepower table for Susquehanna River at Binghamton, N. Y., from 1901 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.					
		1901.[a]	1902.	1903.	1904.	1905.	1906.
330	30	.....	.....	6	.....	.....	2
385	35	.....	.....	7	.....	.....	2
440	40	1	.....	13	.....	.....	5
495	45	6	.....	17	.....	.....	8
550	50	10	.....	19	.....	.....	14
660	60	29	2	23	2	.....	23
770	70	36	6	27	11	.....	41
880	80	60	10	33	28	1	54
990	90	63	14	45	31	7	64
1,100	100	74	31	54	36	15	73
1,320	120	89	52	71	55	33	85
1,540	140	101	77	90	74	66	100
1,760	160	111	96	104	91	89	125
1,980	180	117	133	119	107	117	138

[a] August 1 to December 31.

NOTE.—The minimum flow in the period August 1, 1901, to December 31, 1906, was 210 second-feet, giving 19 horsepower per foot of fall on one day in September, 1906.

SUSQUEHANNA RIVER AT WILKESBARRE, PA.

This station was established March 30, 1899. It is located at the Market Street Bridge, Wilkesbarre, Pa. Gage heights are furnished by the United States Weather Bureau. The conditions at this station and the bench marks are described in Water-Supply

Paper No. 147, page 24, where are given also references to publica[illegible] [illegible] similar data for previous years.

The following discharge measurement was made July 2, 1906:

[illegible] gage height, 1.31 feet, discharge, 1,420 second-feet.

Daily gage heights, in feet, of Susquehanna River at Wilkesbarre, Pa., for 1906.

Day	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.3	
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.3	
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.4	
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.2	
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.0	
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.8	
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.6	
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.4	
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.2	
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.0	
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.9	
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.0	
13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.1	
14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.4	
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.5	
16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.7	
17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.5	
18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.4	
19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.7	
20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.5	
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.4	
22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.0	
23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.1	
24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8.3	
25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.5	
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.7	
27	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.3	
28	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.8	
29	[illegible]	.....	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.6	
30	[illegible]	.....	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.5	
31	[illegible]		[illegible]	.....	[illegible]	.....	[illegible]	[illegible]	.....	[illegible]	.....	

[illegible] for Susquehanna River at Wilkesbarre, Pa., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7,150	7.60	17,130
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7,800	7.80	18,010
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8,480	8.00	18,910
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9,210	9.00	23,700
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9,950	10.00	28,760
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10,710	11.00	33,960
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11,470	12.00	39,510
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12,240	13.00	45,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13,020	14.00	51,700
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13,810	15.00	58,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	14,610	16.00	65,500
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15,430	17.00	73,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	16,270	18.00	80,900

NOTE.—The above table is applicable only for open-channel conditions. It is based on 26 disc[illegible] measurements made during 1905–1906. It is well defined between gage heights 2.2 feet and 21 [illegible]. Below gage height 6 feet the table is the same as for 1904.

Monthly discharge of Susquehanna River at Wilkesbarre, Pa., for 1906.

[Drainage area, 9,810 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	57,000	6,830	15,400	1.57	1.81
February	30,800	4,540	10,700	1.09	1.14
March	76,100	4,280	18,700	1.91	2.20
April	78,500	10,300	37,400	3.81	4.25
May	51,700	4,280	12,100	1.23	1.42
June	29,800	5,340	13,900	1.42	1.58
July	21,200	2,410	6,490	.662	.76
August	7,150	1,630	3,660	.373	.43
September	4,540	1,180	1,870	.191	.21
October	21,700	1,050	5,130	.523	.60
November	25,700	4,030	10,100	1.03	1.15
December	28,200	6,520	15,000	1.53	1.76
The year	78,500	1,050	12,500	1.28	17.31

NOTE.—Owing to ice there may have been considerable backwater during the last week in December. The discharge was computed for open-channel conditions. Values for 1906 are excellent, with the exception of those for September and December, which are good.

SUSQUEHANNA RIVER AT DANVILLE, PA.

This station was established March 25, 1899. It is located at Mill Street Bridge, 600 feet south of the public square, Danville, Pa., near the Pennsylvania Railroad station, South Danville. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 23, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 30, 1906:

Width, 870 feet; area, 3,560 square feet; gage height, 4.23 feet; discharge, 9,360 second-feet.

Daily gage height, in feet, of Susquehanna River at Danville, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.7	5.0	6.1	14.2	5.0	7.4	5.1	3.1	3.9	2.5	4.6	4.3
2	6.1	4.9	5.4	12.5	4.8	6.6	4.8	3.0	3.5	2.5	4.6	4.3
3	5.5	4.5	5.5	10.6	4.6	6.4	4.6	3.0	3.7	2.6	4.6	4.1
4	5.0	4.2	9.25	9.25	4.9	6.3	5.3	3.0	3.3	2.5	4.6	4.3
5	5.2	.....	10.7	8.8	4.6	5.5	6.3	3.3	3.1	2.9	4.4	4.0
6	5.3	.....	9.75	10.3	4.6	4.7	5.5	3.4	3.0	3.1	4.3	4.6
7	5.8	.....	8.8	11.4	5.8	5.2	5.0	3.2	2.9	3.1	4.1	5.7
8	5.4	.....	7.8	11.0	5.6	6.3	4.5	3.6	2.8	3.0	3.9	6.5
9	5.0	.....	6.8	9.3	5.0	6.0	4.2	3.7	2.8	2.9	3.8	7.1
10	4.5	.....	6.2	9.2	5.0	5.5	4.0	3.9	2.8	2.8	3.7	7.6
11	4.4	.....	6.0	11.8	4.8	5.1	4.0	4.1	[illegible]	[illegible]	3.7	6.0
12	4.3	.....	5.3	12.7	4.6	5.4	3.8	3.7	2.7	3.0	3.6	5.3
13	4.0	.....	5.3	11.8	4.6	5.1	3.9	3.4	2.6	3.0	3.5	5.3
14	4.2	.....	5.0	10.5	4.5	5.2	4.1	3.7	2.5	2.9	3.5	5.2
15	4.3	.....	4.1	12.3	4.3	4.8	3.9	3.5	2.5	2.9	3.8	5.1
16	4.5	.....	4.5	13.2	4.3	4.4	.....	3.2	2.1	2.9	3.9	5.1
17	4.5	.....	4.5	12.7	4.4	4.3	.....	3.0	2.4	2.9	4.0	5.7
18	4.5	.....	4.3	11.5	4.3	5.4	.....	2.9	2.4	2.9	4.0	7.6
19	4.3	.....	4.3	9.75	4.5	8.75	.....	2.8	2.3	2.8	4.1	6.8
20	4.2	.....	4.0	8.7	4.8	9.4	.....	2.7	2.3	2.8	5.4	5.6
21	4.4	.....	3.8	7.45	4.7	8.8	.....	2.6	2.3	3.3	7.5	5.5
22	5.1	7.9	3.9	7.1	4.6	8.6	.....	2.7	2.4	6.6	7.5	5.2
23	7.3	12.0	3.8	7.0	4.2	6.9	.....	2.7	2.4	6.5	7.3	5.0
24	9.3	7.5	3.7	6.8	3.9	6.0	.....	3.3	2.4	5.9	7.0	4.7
25	11.6	7.4	3.8	6.9	3.8	5.4	.....	3.3	2.3	5.2	6.5	4.3

Daily gage height, in feet, of Susquehanna River at Danville, Pa., for 1906—Conti

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
26	11.0	7.8	3.8	6.6	3.6	4.9	.....	3.5	2.3	4.8	5.7
27	9.1	7.5	3.7	6.3	3.7	4.5	.....	3.6	2.4	4.6	5.4
28	7.5	6.6	6.65	5.9	4.1	4.4	.....	3.8	2.5	4.5	5.1
29	6.7	.....	13.5	5.5	10.1	4.1	.....	3.6	2.5	4.3	4.7
30	5.9	.....	12.8	5.1	10.1	4.1	.....	3.5	2.5	4.4	4.5
31	5.6	.....	12.5	.....	8.7	.....	.....	3.8	.....	4.5	.....

NOTE.—River frozen February 5-21; backwater, February 23.

Rating table for Susquehanna River at Danville, Pa., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.10	1,640	3.40	5,600	4.70	11,500	7.00	24,500
2.20	1,840	3.50	6,000	4.80	12,020	7.20	25,720
2.30	2,060	3.60	6,400	4.90	12,540	7.40	26,960
2.40	2,300	3.70	6,800	5.00	13,060	7.60	28,260
2.50	2,560	3.80	7,220	5.20	14,150	7.80	29,580
2.60	2,840	3.90	7,660	5.40	15,250	8.00	30,940
2.70	3,140	4.00	8,100	5.60	16,350	9.00	38,200
2.80	3,460	4.10	8,560	5.80	17,450	10.00	46,220
2.90	3,780	4.20	9,040	6.00	18,550	11.00	54,920
3.00	4,120	4.30	9,520	6.20	19,710	12.00	64,320
3.10	4,480	4.40	10,000	6.40	20,900	13.00	74,420
3.20	4,840	4.50	10,500	6.60	22,100	14.00	85,120
3.30	5,220	4.60	11,000	6.80	23,300		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 23 dis measurements made during 1899-1906. It is well defined between gage heights 1.5 feet and 19 fee

Monthly discharge of Susquehanna River at Danville, Pa., for 1906.

[Drainage area, 11,100 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in
January	60,500	8,100	18,800	1.69	
February	29,600	5,500	13,000	1.17	
March	79,700	6,800	22,800	2.05	
April	87,300	13,600	44,800	4.04	
May	47,100	6,400	14,000	1.26	
June	41,300	8,560	18,200	1.64	
July	20,300	3,000	8,100	.730	
August	8,560	2,840	5,330	.480	
September	7,660	1,640	3,200	.288	
October	22,100	2,560	7,000	.631	
November	27,600	6,000	12,300	1.11	
December	28,300	5,600	14,000	1.26	
The year	87,300	1,640	15,100	1.36	

NOTE.—The mean and minimum flows for February and July were determined by compariso the flow at Wilkesbarre. Values for 1906 are excellent, with the exception of February and July. are good.

The following table gives the horsepower (80 per cent efficie per foot of fall that may be developed at different rates of disch and shows the number of days on which the flow and the corresp ing horsepower were, respectively, less than the amounts given i columns for "discharge" and "horsepower."

Discharge and horsepower table for Susquehanna River at Danville, Pa., from 1899 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.							
		1899.[a]	1900.	1901.	1902.	1903.	1904.[b]	1905.	1906.
880	80	.....	3	.....	.....	.....	.....	.....	.....
990	90	.....	30	.....	.....	.....	.....	.....	.....
1,100	100	.....	30	.....	.....	.....	.....	.....	.....
1,320	120	31	55	.....	.....	.....	.....	.....	.....
1,540	140	42	75	.....	.....	.....	.....	.....	.....
1,760	160	59	89	.....	.....	.....	.....	.....	1
1,980	180	71	104	.....	.....	.....	.....	.....	1
2,200	200	83	120	.....	.....	.....	.....	.....	6
2,750	250	127	147	14	6	6	8	.....	21
3,300	300	137	154	29	12	15	39	3	30
3,850	350	142	163	44	16	25	67	10	50
4,400	400	158	173	71	32	39	83	23	61
4,950	450	169	179	91	48	50	95	37	70
5,500	500	173	182	113	53	58	111	60	81
6,600	600	193	186	151	91	75	139	96	105
7,700	700	207	194	171	111	98	156	121	138

[a] March 25 to December 31, 1899.
[b] No records at Danville for 1904. These results are obtained by using the Wilkesbarre records, increased in proportion to the drainage areas of the two stations.

NOTE.—During the period covered by the above table the minimum flow was 830 second-feet, giving 75 horsepower per foot of fall, on three consecutive days in September, 1900.

SUSQUEHANNA RIVER AT HARRISBURG, PA.

Regular daily observations of the stage of Susquehanna River at Harrisburg were started in 1890 by E. Mather, president of the Harrisburg water board. During the first half of 1906 the gage heights were furnished by Mr. Mather and during the last half by the United States Weather Bureau, which now maintains this station. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 26, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 29, 1906:

Width, 2,500 feet; area, 10,100 square feet; gage height, 2.44 feet; discharge, 17,100 second-feet.

Daily gage height, in feet, of Susquehanna River at Harrisburg, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.2	3.9	3.65	10.75	3.35	5.45	2.2	1.7	2.3	1.0	2.8	2.6
2	4.95	3.4	3.5	10.6	3.2	4.6	2.75	1.7	2.2	1.0	2.8	2.5
3	4.4	3.3	3.0	9.1	3.05	4.0	2.45	1.6	2.0	1.0	2.8	2.4
4	4.4	2.8	3.7	7.9	3.05	3.6	2.3	1.7	2.1	1.0	2.7	2.2
5	4.85	2.7	7.5	7.2	3.1	3.2	3.4	1.8	2.5	1.8	2.7	2.1
6	5.15	2.2	7.0	7.3	3.15	3.1	3.3	2.2	2.2	2.2	2.5	2.3
7	5.1	1.8	6.1	8.3	3.6	2.85	2.85	2.2	2.1	1.9	2.4	2.2
8	4.9	1.9	5.8	8.25	3.4	2.9	2.55	2.1	1.9	1.8	2.3	2.3
9	4.1	2.0	4.8	7.4	3.2	3.5	2.3	2.2	1.7	1.6	2.2	4.6
10	3.65	2.0	4.2	7.2	3.0	3.8	2.2	2.3	1.6	1.6	2.1	4.6
11	3.0	2.05	4.0	8.95	3.0	3.3	2.05	2.3	1.5	1.4	2.0	3.9
12	3.0	2.1	3.6	10.1	2.85	2.9	2.0	2.9	1.5	1.4	2.0	3.5
13	3.0	1.9	3.5	9.5	2.8	2.95	1.9	3.7	1.4	1.5	1.9	3.6
14	3.1	2.15	3.5	8.2	2.7	2.8	1.75	3.2	1.4	1.5	1.9	3.5
15	3.2	2.5	3.2	8.85	2.6	2.7	1.9	2.8	1.3	1.4	2.0	3.5

Daily gage height, in feet, of Susquehanna River at Harrisburg, Pa., for 1906—Contin

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	I
16	3.35	2.5	3.1	11.2	2.7	2.6	1.8	2.5	1.2	1.3	2.0	
17	3.1	2.1	3.1	9.9	2.5	2.4	1.8	2.1	1.1	1.3	2.1	
18	3.55	2.2	2.9	8.9	2.55	2.7	1.8	1.9	1.1	1.3	2.1	
19	3.5	2.0	2.7	7.8	2.5	3.9	1.7	1.7	1.0	1.3	2.1	
20	3.3	2.0	2.7	6.6	2.7	6.8	2.4	1.6	1.1	2.0	2.2	
21	3.3	2.15	2.5	5.8	2.75	5.9	2.2	2.1	1.0	3.5	3.2	
22	3.6	2.7	2.5	5.35	2.6	5.4	2.2	2.3	1.0	4.4	4.2	
23	3.55	2.55	2.6	4.9	2.45	4.9	2.1	2.0	1.0	5.1	4.2	
24	4.5	3.9	2.3	4.6	2.3	4.2	2.0	2.0	.9	4.4	4.2	
25	9.15	3.75	2.35	4.8	2.1	3.7	1.9	2.4	.9	4.0	4.0	
26	8.75	4.3	2.4	4.6	2.05	3.3	1.8	2.2	1.0	3.6	3.7	
27	7.4	4.6	2.3	4.5	2.15	2.95	1.8	2.2	1.0	3.3	3.3	
28	6.35	4.0	3.1	4.25	2.25	2.7	1.7	2.8	1.0	3.0	3.0	
29	5.3	.....	8.05	3.85	3.8	2.45	1.7	3.2	1.0	2.9	2.9	
30	4.7	.....	10.2	3.6	7.2	2.35	1.7	2.8	1.0	2.9	2.7	
31	4.4	.....	9.5	.....	6.6	.....	1.7	2.4	.....	2.8	.....	

NOTE.—Ice conditions existed during portions of January, February, and March.

Rating table for Susquehanna River at Harrisburg, Pa., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	6,030	2.20	15,050	3.50	29,430	5.60	61,700
1.00	6,550	2.30	15,980	3.60	30,800	5.80	65,000
1.10	7,090	2.40	16,950	3.70	32,200	6.00	68,400
1.20	7,650	2.50	17,960	3.80	33,600	6.20	71,900
1.30	8,240	2.60	19,010	3.90	35,000	6.40	75,500
1.40	8,850	2.70	20,100	4.00	36,400	6.60	79,200
1.50	9,520	2.80	21,210	4.20	39,200	6.80	82,900
1.60	10,200	2.90	22,340	4.40	42,200	7.00	86,600
1.70	10,930	3.00	23,480	4.60	45,400	8.00	105,600
1.80	11,700	3.10	24,620	4.80	48,600	9.00	125,100
1.90	12,500	3.20	25,760	5.00	51,900	10.00	145,600
2.00	13,300	3.30	26,910	5.20	55,100	11.00	167,500
2.10	14,160	3.40	28,130	5.40	58,400	12.00	190,500

NOTE.—The above table is applicable only for open-channel conditions. It is based on 45 disch measurements made during 1897-1906. It is well defined throughout. Below 7 feet the table is the s as for 1904.

Monthly discharge of Susquehanna River at Harrisburg, Pa., for 1906.

[Drainage area, 24,000 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dept inch
January	128,000	23,500	45,800	1.91	
February	45,400	11,700	21,000	.875	
March	150,000	16,000	42,700	1.78	
April	172,000	30,800	95,300	3.97	
May	90,400	13,700	25,600	1.07	
June	82,900	16,500	32,200	1.34	
July	28,100	10,900	14,800	.617	
August	32,200	10,200	16,200	.675	
September	18,000	6,030	9,470	.395	
October	53,500	6,550	17,400	.725	
November	39,200	12,500	20,800	.867	
December	45,400	14,200	26,100	1.09	
The year	172,000	6,030	30,600	1.28	1

NOTE.—The computation of discharge for January, February, and March is based on open-cha conditions; the effect of ice was immaterial. Values for 1906 are excellent.

The following table gives the horsepower (80 per cent efficiency) : foot of fall that may be developed at different rates of discharge d shows the number of days on which the flow and the correspond- g horsepower were respectively less than the amounts given in the lumns for "discharge" and "horsepower."

charge and horsepower table for Susquehanna River at Harrisburg, Pa., from 1891 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.							
		1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.
2,750	250	.....	.....	.....	.....	4	.....	.....	.....
3,300	300	.....	.....	.....	2	20	9	.....	.....
3,850	350	.....	.....	11	10	50	18	.....	.....
4,400	400	.....	9	16	11	62	22	3	.....
4,950	450	.....	14	22	14	89	28	21	7
5,500	500	.....	16	24	18	104	31	32	15
6,600	600	.....	37	31	31	133	39	53	33
7,700	700	.....	49	34	47	139	42	66	37
8,800	800	.....	59	40	59	158	48	80	43
9,900	900	.....	76	55	72	169	70	94	50
11,000	1,000	10	88	75	78	172	93	104	57
12,100	1,100	14	100	92	82	178	108	117	61
13,200	1,200	18	106	96	84	183	114	119	68
14,300	1,300	45	124	134	93	188	125	133	85
15,400	1,400	54	132	142	96	188	128	138	89
16,500	1,500	72	144	158	108	192	141	142	105
17,600	1,600	78	150	160	116	195	146	144	109
18,700	1,700	90	163	178	127	201	158	160	120
19,800	1,800	102	166	181	135	203	163	162	122
20,900	1,900	122	174	194	144	213	179	180	137
22,000	2,000	127	187	203	153	218	183	185	139

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.							
		1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
2,750	250	.....	23	.....	.....	.....	.....	.....	.....
3,300	300	3	38	.....	.....	.....	.....	.....	.....
3,850	350	17	44	.....	.....	.....	.....	.....	.....
4,400	400	28	53	.....	.....	.....	.....	.....	.....
4,950	450	48	72	.....	.....	.....	.....	.....	.....
5,500	500	62	84	.....	.....	.....	.....	.....	.....
6,600	600	83	118	1	13	3	5	.....	15
7,700	700	100	134	7	19	5	26	.....	19
8,800	800	119	148	15	28	16	53	.....	24
9,900	900	139	154	28	36	21	82	.....	33
11,000	1,000	147	157	55	54	36	116	15	48
12,100	1,100	153	164	86	65	42	142	32	58
13,200	1,200	157	187	97	73	52	163	60	68
14,300	1,300	164	180	121	83	72	174	86	100
15,400	1,400	167	190	125	96	84	179	100	122
16,500	1,500	175	198	141	111	101	185	124	135
17,600	1,600	181	205	150	123	106	188	143	147
18,700	1,700	196	214	161	126	109	200	160	162
19,800	1,800	201	217	171	138	122	203	170	167
20,900	1,900	210	220	182	146	128	206	180	182
22,000	2,000	215	224	186	151	141	209	187	195

NOTE.—From 1891 to 1906 the minimum flow was 2,330 second-feet, giving 212 horsepower, on two nsecutive days in September, 1900. For days on which no gage readings were made at this station e table is based on discharges at McCall Ferry, with appropriate reduction. No correction has been ade for ice except in 1904. In general the results would probably be affected only slightly by ice nditions.

SUSQUEHANNA RIVER NEAR M'CALL FERRY, PA.

This station was established May 17, 1902, by Boyd Ehle, who fu nishes the gage heights. It is located at a narrow and rocky part Susquehanna River, about 20 miles above its mouth and 1 mile abo the village of McCall Ferry.

The measurements at this station have been referred to two pe manent gages, designated as Nos. 2 and 5, which give elevatior directly above sea level. No. 2 is about three-fourths mile below th village of McCall Ferry, in the tailrace of the proposed power hous It was read daily from June, 1902, through February, 1906, whe operations at the dam began to cause backwater at the gage. Gag No. 5 is about 2 miles below McCall Ferry, at the foot of Cullys Fall and is so located as to be entirely out of the influence of the dar Regular readings on this gage were not made until March 1, 190 since which time it has been used exclusively. The conditions at th station and the bench marks are described in Water-Supply Pap No. 167, page 29, where are given also references to publications th contain data for previous years.

Daily gage height, in feet, of Susquehanna River near McCall Ferry, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1	107.17	106.24	105.8	116.0	105.7	109.2	103.1	103.0	103.8	101.3	104.2	10
2	105.97	105.88	105.8	117.8	105.4	107.7	102.8	102.9	103.7	101.8	104.2	10
3	106.15	105.02	105.6	115.9	105.3	106.6	103.1	103.1	103.6	101.5	104.1	10
4	106.96	104.41	110.7	113.9	105.2	106.0	103.0	103.3	103.2	101.0	104.0	10
5	106.75	104.33	111.1	112.0	105.0	105.6	103.8	104.9	103.2	102.5	104.0	10
6	108.28	103.90	112.0	111.4	105.0	105.1	105.0	103.7	104.0	104.2	104.0	10
7	108.28	102.98	111.0	112.0	105.1	104.9	104.8	103.7	103.6	103.2	103.9	10
8	107.89	102.57	109.6	113.4	105.9	104.7	104.2	103.5	103.2	103.0	103.5	10
9	107.17	102.41	108.8	112.5	105.7	104.8	103.9	103.6	102.8	102.4	103.2	10
10	105.29	102.81	107.5	113.0	105.1	105.9	103.5	103.6	102.5	102.2	103.3	10
11	105.29	102.98	.....	113.3	104.9	105.9	103.5	103.6	103.0	102.0	103.3	10
12	104.55	102.81	106.0	115.9	104.8	105.0	103.4	103.8	103.4	101.8	103.0	10
13	104.94	102.73	105.9	115.8	104.6	104.5	103.0	104.6	102.0	101.8	102.6	10
14	104.94	103.14	105.8	114.2	104.6	104.8	102.9	105.2	102.1	101.8	102.5	10
15	105.11	103.56	105.5	114.0	104.5	104.6	102.8	104.9	102.0	102.1	102.5	10
16	105.11	104.07	105.9	119.0	104.4	104.5	102.9	104.5	102.4	101.7	102.5	10
17	105.46	103.64	105.1	117.0	104.3	105.1	103.2	103.8	102.4	101.7	102.5	10
18	105.62	103.39	104.8	115.3	104.2	104.4	103.0	103.5	102.4	101.6	102.6	10
19	105.62	103.47	104.8	113.4	104.1	105.5	102.9	103.0	102.0	101.4	102.6	10
20	105.37	103.39	104.8	111.6	104.1	108.3	102.7	102.9	101.9	102.0	102.6	10
21	105.29	103.64	104.1	110.0	104.1	110.0	103.5	102.8	101.9	104.6	103.0	10
22	105.20	104.94	104.3	109.0	104.2	109.5	103.4	103.7	101.5	105.4	105.0	10
23	105.29	105.62	104.1	108.1	104.1	108.6	103.5	103.9	101.5	106.8	106.0	10
24	105.62	106.34	103.9	107.6	103.7	107.2	103.4	103.2	101.2	107.4	106.0	10
25	110.77	105.97	103.8	107.4	103.3	106.2	103.3	102.9	101.5	106.4	106.0	10
26	114.73	107.76	103.6	107.3	103.1	105.6	103.2	103.8	101.1	105.6	105.6	10
27	112.84	107.40	103.7	107.3	102.9	105.1	103.0	103.6	101.2	105.2	105.2	10
28	110.65	106.64	104.7	106.9	103.1	104.5	103.0	103.9	101.3	104.8	104.8	10
29	109.45	.....	107.5	106.2	103.4	103.9	103.2	104.5	101.4	104.4	104.4	10
30	107.89	.....	116.6	106.0	108.0	103.4	103.1	104.7	101.4	104.0	104.0	10
31	106.96	.....	115.8	.....	110.7	.....	103.0	104.2	.....	104.0	.....	10

NOTE.—All above gage heights refer to Cullys Falls gage.

Rating table for Susquehanna River near McCall Ferry, Pa., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
101.00	5,300	102.80	14,990	105.20	32,600	111.50	94,300
101.10	5,740	102.90	15,640	105.40	34,240	112.00	100,500
101.20	6,190	103.00	16,300	105.60	35,920	112.50	106,980
101.30	6,650	103.10	16,960	105.80	37,640	113.00	113,700
101.40	7,120	103.20	17,640	106.00	39,400	113.50	120,660
101.50	7,600	103.30	18,320	106.20	41,160	114.00	127,800
101.60	8,090	103.40	19,000	106.40	42,940	114.50	135,000
101.70	8,600	103.50	19,700	106.60	44,740	115.00	142,300
101.80	9,120	103.60	20,400	106.80	46,560	115.50	149,600
101.90	9,650	103.70	21,120	107.00	48,400	116.00	157,000
102.00	10,200	103.80	21,840	107.50	53,000	116.50	164,500
102.10	10,760	103.90	22,560	108.00	57,600	117.00	172,000
102.20	11,330	104.00	23,300	108.50	62,300	117.50	179,600
102.30	11,910	104.20	24,800	109.00	67,100	118.00	187,300
102.40	12,500	104.40	26,320	109.50	71,960	119.00	202,900
102.50	13,110	104.60	27,860	110.00	77,000	120.00	218,800
102.60	13,720	104.80	29,420	110.50	82,500		
102.70	14,350	105.00	31,000	111.00	88,300		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 37 discharge measurements made during 1902–1904. It is well defined above gage height 10.12 feet.

Monthly discharge of Susquehanna River near McCall Ferry, Pa., for 1906.

[Drainage area, 26,800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	138,000	27,400	49,700	1.85	2.13
February	55,400	12,500	26,800	1.00	1.04
March	166,000	20,400	51,000	1.90	2.19
April	203,000	39,400	107,000	3.99	4.45
May	84,800	15,600	29,900	1.12	1.29
June	77,000	19,000	39,200	1.46	1.63
July	31,000	14,400	18,600	.694	.80
August	32,600	15,000	21,600	.806	.93
September	23,300	5,740	12,800	.478	.53
October	52,100	5,300	19,000	.709	.82
November	39,400	13,100	22,600	.843	.94
December	48,400	17,600	29,100	1.09	1.26
The year	203,000	5,300	35,600	1.33	18.01

NOTE.—Values for entire year are excellent.

CHENANGO RIVER AT BINGHAMTON, N. Y.

This station, which was established July 31, 1901, is located at the Court Street Bridge, Binghamton. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 32, where are given also references to publications that contain data for previous years.

Discharge measurements of Chenango River at Binghamton, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
October 3	C. C. Covert	225	464	5.30	396
November 8	do	300	681	5.95	1,050

Daily gage height, in feet, of Chenango River at Binghamton, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	7.65	6.88	5.99	11.36	6.32	7.25	7.23	5.58	5.5	5.28	6.68	[illegible]
2	7.32	6.6	6.22	9.74	6.22	6.88	7.36	5.5	5.4	5.28	6.55	[illegible]
3	6.92	5.82	6.19	8.81	8.22	6.58	6.76	5.5	5.4	5.28	6.38	[illegible]
4	7.1	6.02	11.02	8.71	8.56	6.43	6.46	5.68	5.5	5.28	6.25	[illegible]
5	8.1	6.22	12.47	10.23	7.64	6.25	6.33	6.2	5.42	5.3	6.18	[illegible]
6	7.78	6.12	9.09	11.07	7.52	7.13	6.21	5.9	5.42	5.28	6.12	[illegible]
7	7.15	6.0	7.62	9.9	7.26	7.20	6.01	6.2	5.4	5.25	6.02	[illegible]
8	7.0	6.02	5.72	9.07	6.96	6.84	5.93	6.02	5.3	5.72	5.9	[illegible]
9	6.52	5.92	6.92	8.73	6.76	6.34	5.89	5.82	5.28	5.65	5.88	[illegible]
10	6.3	5.95	6.72	10.37	6.94	6.72	6.76	5.45	5.15	5.58	5.82	[illegible]
11	6.4	5.95	6.47	12.9	6.76	7.07	7.31	5.62	5.2	5.6	5.8	[illegible]
12	6.5	5.98	6.39	11.83	6.56	7.27	7.03	5.72	5.2	5.75	6.28	[illegible]
13	6.5	5.88	6.27	10.45	6.49	6.57	6.53	5.75	5.0	5.6	6.22	[illegible]
14	6.6	5.95	6.19	9.75	6.99	6.24	6.26	5.58	5.12	5.6	6.22	[illegible]
15	6.5	5.82	6.08	12.07	7.06	6.12	6.09	5.52	5.25	5.5	6.1	[illegible]
16	6.45	5.82	6.04	13.03	6.46	6.22	5.96	5.42	5.22	5.48	6.08	[illegible]
17	6.62	5.8	5.98	11.3	6.38	6.57	5.93	5.42	5.05	5.42	6.0	[illegible]
18	6.6	5.75	5.94	9.6	6.68	7.17	6.01	5.38	5.08	5.32	6.18	[illegible]
19	6.5	5.8	5.91	8.73	6.63	7.97	5.93	5.3	4.95	5.3	9.12	[illegible]
20	6.4	5.75	5.71	8.17	6.33	7.94	5.88	5.3	5.0	8.7	9.2	[illegible]
21	6.68	5.87	5.98	7.73	6.21	7.27	5.9	5.82	5.3	8.3	8.5	[illegible]
22	8.9	8.25	6.06	7.6	6.05	6.87	5.8	6.18	5.4	7.5	8.38	[illegible]
23	11.5	9.02	5.96	7.65	5.95	6.54	5.68	5.8	5.32	6.85	8.25	[illegible]
24	13.45	8.29	5.91	7.4	5.93	6.40	5.65	5.8	5.38	6.48	7.42	[illegible]
25	11.65	8.35	5.81	7.03	5.88	6.24	5.58	5.52	5.48	6.42	7.05	[illegible]
26	9.35	8.89	5.78	6.79	6.33	6.12	5.5	5.4	5.38	6.58	6.85	[illegible]
27	8.3	7.99	6.84	6.59	8.85	6.02	5.48	5.5	5.32	6.35	6.7	[illegible]
28	7.75	6.37	13.41	6.52	11.78	5.93	5.48	6.15	5.3	6.52	6.7	[illegible]
29	7.32	.....	12.66	6.32	10.98	6.06	5.45	6.15	5.28	6.55	6.7	[illegible]
30	6.88	.....	10.51	6.26	8.93	6.11	5.5	5.82	5.2	6.48	6.6	[illegible]
31	6.95	.....	13.08	.....	7.83	.....	5.55	5.7	.....	6.52	.....	[illegible]

NOTE.—River seldom freezes over at the gage, but there was considerable needle ice during Janu and February and part of December.

Rating table for Chenango River at Binghamton, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.90	115	6.20	1,360	7.50	3,220	9.60	6,790
5.00	175	6.30	1,490	7.60	3,375	9.80	7,140
5.10	240	6.40	1,625	7.70	3,535	10.00	7,500
5.20	315	6.50	1,760	7.80	3,695	10.20	7,860
5.30	396	6.60	1,900	7.90	3,855	10.40	8,220
5.40	480	6.70	2,040	8.00	4,020	10.60	8,590
5.50	570	6.80	2,180	8.20	4,355	10.80	8,970
5.60	665	6.90	2,325	8.40	4,695	11.00	9,350
5.70	765	7.00	2,470	8.60	5,040	12.00	11,250
5.80	875	7.10	2,615	8.80	5,390	13.00	13,250
5.90	990	7.20	2,765	9.00	5,740	14.00	15,300
6.00	1,110	7.30	2,915	9.20	6,090		
6.10	1,235	7.40	3,065	9.40	6,440		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge m urements made during 1901–1906. It is well defined between gage heights 5.3 feet and 10 feet, and is ba on one high-water measurement above 10 feet.

Monthly discharge of Chenango River at Binghamton, N. Y., for 1906.

[Drainage area, 1,530 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	14,200	1,490	3,550	2.32	2.68
February	5,780	820	1,930	1.26	1.31
March	14,100	776	3,520	2.30	2.65
April	13,300	1,440	6,220	4.07	4.54
May	10,800	967	2,910	1.90	2.19
June	3,970	1,030	2,040	1.33	1.48
July	3,000	525	1,300	.850	.98
August	1,360	396	789	.516	.59
September	570	145	380	.248	.28
October	5,220	355	1,260	.824	.95
November	6,090	875	2,180	1.42	1.58
December	8,220	875	2,700	1.76	2.03
The year	14,200	145	2,400	1.57	21.26

NOTE.—Values for January, February, and December are probably slightly in excess of the true value owing to needle ice. Values for entire year are excellent except January, February, and December, which are good.

CHEMUNG RIVER AT CHEMUNG, N. Y.

This station was established September 7, 1903. It is located at the suspension highway bridge, midway between Chemung, N. Y., and Willawana, Pa., near the State line. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 35, where are given also references to publications that contain data for previous years.

Discharge measurements of Chemung River at Chemung, N. Y., in 1905-6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
March 21	F. H. Brundage	391	3,380	9.46	16,500
March 22	do	389	3,410	9.49	16,600
March 22	do	389	3,060	8.84	13,900
March 26	W. B. Freeman	393	4,400	12.10	29,300
March 26	do	393	4,190	11.39	25,900
May 18	H. R. Beebe	220	1,040	2.64	714
July 20	Murphy and Covert	216	1,060	2.62	748
August 23	Covert and Weeks	197	904	2.28	435
1906.					
February 17	Covert and Weeks	225	1,040	[a] 2.85	674
March 30	Horton and Mott	393	2,560	7.20	9,850
March 31	R. E. Horton	395	4,340	11.73	27,500
March 31	do	394	4,120	11.40	25,600
July 27	C. C. Covert	200	935	2.29	416
September 15	do	186	890	1.89	216
October 4	do	203	879	2.63	381

[a] Ice conditions; gage height to bottom of ice, 2.42 feet; average thickness of ice, .53 feet; considerable needle ice.

Daily gage height, in feet, of Chemung River at Chemung, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	I
1	4.27	3.4	2.52	7.42	3.15	4.44	3.34	2.28	2.19	1.55	3.46	
2	3.93	3.16	2.56	6.54	3.09	4.15	3.42	2.24	2.04	1.73	3.31	
3	3.54	3.24	2.57	5.93	3.28	3.73	5.2	2.2	2.14	1.89	3.25	
4	3.70	3.36	8.6	6.23	3.99	3.48	4.15	2.18	2.16	1.77	3.27	
5	4.44	3.24	5.2	7.3	3.75	3.35	3.57	3.29	2.08	1.95	3.2	
6	4.0	2.94	3.96	7.92	3.8	5.25	3.28	3.05	2.14	1.74	3.06	
7	3.52	2.8	3.64	6.8	3.65	5.06	3.03	2.96	2.12	1.8	2.89	
8	2.97	2.84	3.4	5.92	3.35	4.12	2.85	3.68	.....	2.87	2.81	
9	2.66	2.92	3.3	5.68	3.25	3.74	2.83	3.76	.....	2.58	2.77	
10	2.74	2.84	3.14	8.32	3.63	3.58	2.74	3.28	.....	2.38	2.64	
11	2.86	2.71	2.97	8.4	3.55	3.65	2.68	3.85	1.78	2.12	2.62	
12	3.02	2.88	2.9	7.14	3.26	3.47	2.66	4.15	1.81	2.31	2.66	
13	2.92	2.66	2.85	6.33	3.24	3.15	2.55	3.52	1.96	2.36	2.74	
14	2.86	2.64	2.74	5.82	3.22	2.84	2.45	3.1	2.09	2.4	2.92	
15	2.86	2.7	2.7	6.73	3.2	2.85	2.4	2.82	1.78	2.41	2.97	
16	2.79	2.72	2.71	6.82	3.2	3.38	2.33	2.58	1.62	2.36	2.96	
17	2.6	2.8	2.6	5.92	3.29	6.53	2.35	2.46	1.74	2.22	2.9	
18	2.78	2.8	2.32	5.36	4.94	7.11	2.44	2.39	1.62	2.17	3.04	
19	2.78	2.6	2.56	4.92	4.54	6.12	2.6	2.32	1.56	2.14	6.13	
20	2.79	2.62	2.2	4.56	3.92	6.13	2.59	2.61	1.52	5.4	5.84	
21	2.78	2.79	2.38	4.24	3.44	4.92	2.47	3.36	1.54	5.32	5.63	
22	4.54	3.31	2.58	4.34	3.28	4.29	2.51	3.1	1.54	4.9	5.6	
23	7.02	3.35	2.44	4.25	3.18	3.9	2.34	2.66	1.63	4.28	4.88	
24	8.08	2.94	2.58	3.7	3.06	3.81	2.32	3.1	1.84	3.8	4.34	
25	5.77	2.58	2.43	3.96	3.25	3.43	2.3	3.04	1.8	3.48	3.78	
26	4.56	2.7	2.54	3.81	3.14	3.2	2.28	2.68	1.72	3.36	3.76	
27	4.14	2.86	3.88	3.56	6.72	3.04	2.28	2.67	1.74	3.28	3.58	
28	3.93	2.54	11.94	3.37	8.68	2.93	2.36	2.6	1.54	3.09	3.36	
29	3.64	.....	7.25	3.29	6.9	3.5	2.59	2.69	1.53	3.16	3.26	
30	3.51	.....	7.06	3.21	5.42	3.48	2.38	2.44	1.49	3.1	3.16	
31	3.33	.....	11.09	.....	4.72	.....	2.31	2.2	.....	3.08	.....	

NOTE.—Ice conditions as follows: Shore ice only in January; river frozen over February 2 and j ably remained frozen until the latter part of the month; considerable anchor ice during the gr part of December; river frozen over December 25; ice went out December 31.

Rating table for Chemung River at Chemung, N. Y., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.50	85	3.00	1,010	4.50	3,200	7.00	9,220
1.60	115	3.10	1,110	4.60	3,400	7.20	9,790
1.70	145	3.20	1,220	4.70	3,610	7.40	10,390
1.80	180	3.30	1,335	4.80	3,820	7.60	11,010
1.90	220	3.40	1,455	4.90	4,030	7.80	11,650
2.00	270	3.50	1,580	5.00	4,240	8.00	12,300
2.10	325	3.60	1,710	5.20	4,680	9.00	15,800
2.20	385	3.70	1,850	5.40	5,130	10.00	19,700
2.30	450	3.80	2,000	5.60	5,590	11.00	24,000
2.40	515	3.90	2,160	5.80	6,060	12.00	28,700
2.50	585	4.00	2,320	6.00	6,550	13.00	33,500
2.60	660	4.10	2,480	6.20	7,070	14.00	39,300
2.70	740	4.20	2,650	6.40	7,590		
2.80	825	4.30	2,830	6.60	8,130		
2.90	915	4.40	3,010	6.80	8,670		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge r urements made during 1903–1906. It is well defined above gage height 1.9 feet.

Monthly discharge of Chemung River at Chemung, N. Y., for 1905–6.

[Drainage area, 2,440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
January 1-15 [a]	5,920	615	2,050	0.840	0.47
March 19-31 [a]	39,800	8,130	22,600	9.26	4.48
April	6,420	1,580	3,280	1.34	1.50
May	1,430	385	728	.298	.34
June	22,000	298	2,960	1.21	1.35
July	4,280	337	1,040	.426	.49
August	2,400	220	622	.255	.29
September	757	204	390	.160	.18
October	1,010	200	491	.201	.23
November	2,350	314	579	.237	.26
December	9,360	630	2,900	1.19	1.37
1906.					
January	12,600	660	2,300	.943	1.09
February [b]			2,000	.820	.85
March	28,400	385	3,670	1.50	1.73
April	13,600	1,230	6,040	2.48	2.77
May	14,600	1,070	2,680	1.10	1.27
June	9,530	861	2,780	1.14	1.27
July	4,680	437	905	.371	.43
August	2,560	373	975	.400	.46
September	379	82	204	.084	.09
October	5,130	100	1,120	.459	.53
November	6,890	676	1,960	.803	.90
December [b]	7,230	482	2,090	.857	.99
The year	28,400	82	2,230	.913	12.38

[a] A comparison of these figures with those for the discharge of Susquehanna River at McCall Ferry indicates that the mean discharge at the station for the period in 1905 not included in the table was approximately as follows: January 16-31, about 1,700 second-feet; February, about 900 second-feet; March 1-18, about 2,500 second-feet.

[b] Estimates for frozen period of 1906 are based on discharge of Susquehanna River at Binghamton.

NOTE.—Values for 1905 and 1906 are excellent, except those for February, 1906, which are fair.

WEST BRANCH OF SUSQUEHANNA RIVER AT WILLIAMSPORT, PA.

This station at Williamsport was established March 1, 1895, by George D. Snyder, who was at that time city engineer, and daily gage heights have been recorded since that date. It is located at the Market Street Bridge. The conditions at this station and the bench marks are described in Water Supply Paper No. 167, page 37, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 30, 1906:

Width, 744 feet; area, 3,620 square feet; gage height, 1.27 feet; discharge, 2,360 second-feet.

Daily gage height, in feet, of West Branch of Susquehanna River at Williamsport, Pa.

1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	5.7	3.7	1.9	10.7	2.9	5.2	1.1	1.4	1.3	0.9	2.2
2	5.2	3.4	1.2	9.6	2.7	4.5	1.0	1.3	1.0	.8	2.2
3	4.5	2.5	1.3	8.2	2.7	3.9	1.1	1.1	1.3	.9	2.3
4	4.3	2.3	4.4	7.6	2.8	3.4	1.1	1.9	2.7	1.0	2.1
5	5.4	2.5	5.3	7.6	2.9	2.9	1.1	2.2	2.5	.9	2.1
6	6.3	2.6	4.0	8.5	3.1	2.7	1.1	1.8	2.5	1.2	2.1
7	5.3	2.0	3.4	8.5	2.8	2.8	.9	1.7	2.1	1.4	1.9
8	4.6	1.9	3.1	7.5	2.6	2.6	.8	1.7	1.6	1.4	1.8
9	3.7	2.0	2.7	6.4	2.4	2.3	.8	1.7	1.2	1.4	1.9
10	3.7	2.2	2.8	7.7	2.4	2.1	.7	2.7	1.1	1.5	1.7
11	3.4	2.1	2.5	10.8	2.5	2.1	.6	3.9	.8	1.3	1.6
12	2.7	1.9	2.4	10.1	2.5	2.1	.4	5.7	.7	1.3	1.7
13	3.3	1.8	2.2	8.5	2.4	1.9	.5	4.6	1.0	1.4	1.7
14	3.2	1.9	2.1	7.3	2.3	1.7	.5	3.8	.9	1.2	1.7
15	3.1	2.3	2.1	7.2	2.2	1.5	.6	3.0	1.0	1.2	1.7
16	2.9	2.2	1.9	8.0	2.2	1.4	.4	2.4	1.0	1.2	1.6
17	2.9	1.6	1.9	7.4	2.1	2.0	.4	2.2	.9	1.1	1.6
18	3.1	1.4	1.8	6.5	2.8	2.0	3.5	1.7	.9	1.0	1.6
19	3.2	1.4	1.7	5.8	2.7	3.0	2.5	1.4	1.0	1.1	2.3
20	3.4	1.6	1.6	5.2	2.4	3.6	2.3	1.4	.8	2.1	3.1
21	3.9	1.5	1.3	4.9	2.2	3.1	2.3	1.7	.8	5.7	3.5
22	3.8	1.7	1.5	4.5	2.0	2.9	1.9	1.9	.9	5.2	3.7
23	5.6	1.9	1.7	4.3	1.8	2.2	1.7	2.4	1.0	4.3	3.9
24	11.4	1.8	1.6	4.3	1.7	1.9	1.7	2.2	1.1	3.6	3.9
25	10.7	1.9	1.4	4.2	1.9	1.7	1.5	2.0	1.1	3.3	3.4
26	8.4	2.0	1.6	4.0	2.3	1.5	1.5	1.9	1.0	2.9	3.2
27	6.9	1.9	1.9	3.7	2.3	1.4	1.4	1.7	.9	2.6	3.1
28	6.1	1.2	4.3	3.4	7.7	1.3	1.2	2.2	.9	2.6	2.7
29	5.2	.....	8.9	3.2	8.3	1.2	1.2	2.0	.8	2.4	2.5
30	4.8	.....	7.7	3.1	7.3	1.2	1.6	1.8	.8	2.3	2.5
31	4.1	.....	8.4	.....	6.0	.....	1.5	1.5	.....	2.3	.....

Rating table for West Branch of Susquehanna River at Williamsport, Pa., for 190

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.40	1,120	1.70	3,460	3.00	6,580	5.60	16,250
0.50	1,280	1.80	3,660	3.20	7,170	5.80	17,150
0.60	1,440	1.90	3,860	3.40	7,780	6.00	18,060
0.70	1,610	2.00	4,070	3.60	8,400	6.20	18,980
0.80	1,780	2.10	4,300	3.80	9,030	6.40	19,940
0.90	1,960	2.20	4,530	4.00	9,690	6.60	20,900
1.00	2,140	2.30	4,770	4.20	10,400	6.80	21,900
1.10	2,320	2.40	5,010	4.40	11,150	7.00	22,900
1.20	2,510	2.50	5,250	4.60	11,940	8.00	28,000
1.30	2,700	2.60	5,500	4.80	12,750	9.00	33,460
1.40	2,890	2.70	5,760	5.00	13,600	10.00	39,180
1.50	3,080	2.80	6,020	5.20	14,470	11.00	45,400
1.60	3,270	2.90	6,300	5.40	15,350	12.00	52,400

NOTE.—The above table is applicable only for open-channel conditions. It is based on the disc measurements made during 1901-1906. It is well defined between gage heights 1.4 feet and 16 fe

Monthly discharge of West Branch of Susquehanna River at Williamsport, Pa., for 1906.

[Drainage area, 5,640 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	48,000	5,760	14,100	2.50	2.88
February	8,710	2,510	4,270	.757	.79
March	32,900	2,510	7,600	1.35	1.56
April	44,100	6,870	22,000	3.90	4.35
May	29,600	3,460	7,630	1.35	1.56
June	14,500	2,510	5,320	.943	1.05
July	8,090	1,120	2,700	.479	.55
August	16,700	2,320	4,900	.869	1.00
September	5,760	1,610	2,530	.449	.50
October	16,700	1,780	4,540	.805	.93
November	9,360	3,270	5,120	.908	1.01
December	14,500	3,270	7,020	1.24	1.43
The year	48,000	1,120	7,310	1.30	17.61

NOTE.—Values are rated as follows: January, March to June, November, and December are excellent; remainder of the year good.

The following table gives the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge, and shows the number of days on which the flow and the corresponding horsepower were respectively less than the amounts given in the columns for "discharge" and "horsepower."

Discharge and horsepower table for West Branch of Susquehanna River at Williamsport, Pa., from 1895 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.											
		1895.[a]	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
440	40	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
495	45	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
550	50	17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
660	60	28	.....	2	.....	3	.....	.....	.....	.....	.....	.....	.....
770	70	43	.....	5	.....	13	17	.....	.....	.....	.....	.....	.....
880	80	76	.....	8	.....	24	37	.....	5	.....	15	.....	.....
990	90	96	2	18	.....	47	46	.....	6	.....	32	.....	.....
1,100	100	96	2	18	.....	47	46	.....	6	.....	32	.....	.....
1,320	120	112	17	39	19	75	55	4	25	1	67	.....	5
1,540	140	118	27	47	30	89	63	18	30	4	86	.....	7
1,760	160	124	30	56	40	96	76	28	30	5	103	2	9
1,980	180	136	36	71	53	106	113	50	43	10	118	7	27
2,200	200	142	43	84	66	114	131	64	54	23	132	10	37
2,750	250	160	59	108	90	133	150	100	89	46	150	24	67
3,300	300	186	86	125	111	150	159	126	119	77	168	54	101
3,850	350	195	101	138	131	150	169	138	137	98	185	87	130
4,400	400	207	127	162	160	170	194	158	158	125	194	119	174

[a] March 1 to December 31, 1895.

NOTE.—During period covered by the above table the minimum flow was 410 second-feet, giving 37 horsepower per foot of fall for five days in 1905.

JUNIATA RIVER AT NEWPORT, PA.

This gaging station was established March 21, 1899, and discontinued July 14, 1906. Until the autumn of 1904 it was located on the covered wagon bridge 800 feet east of the public square at Newport, Pa. In the latter part of 1904 this bridge was removed and a steel structure erected on the same site. The conditions at this station and the bench marks are described in Water-Supply Paper No. 137, page 40, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 28, 1906:

Width, 534 feet; area, 1,190 square feet; gage height, 378 feet; discharge, 2,330 second-feet.

Daily gage height, in feet, of Juniata River at Newport, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	5.0	3.9	3.7	10.0	4.0	3.4	[illegible]
2	4.9	3.9	3.8	9.8	4.0	3.4	[illegible]
3	5.0	3.9	4.0	9.7	4.0	3.4	[illegible]
4	7.5	3.8	6.1	8.8	4.0	3.4	[illegible]
5	7.5	3.8	6.0	8.4	4.0	3.3	[illegible]
6	7.4	3.7	5.9	7.9	4.0	3.3	[illegible]
7	6.7	3.7	5.9	7.9	4.2	3.3	[illegible]
8	5.9	3.7	5.6	7.9	4.2	3.3	[illegible]
9	5.4	3.7	5.0	8.0	4.0	4.35	[illegible]
10	4.8	3.8	4.8	7.7	4.0	6.0	[illegible]
11	4.8	3.7	4.6	9.3	3.9	4.2	[illegible]
12	4.6	3.7	4.6	8.2	3.9	3.6	[illegible]
13	4.6	3.6	4.5	8.2	3.8	3.6	[illegible]
14	4.6	3.6	4.5	8.0	3.6	3.6	[illegible]
15	4.8	3.6	4.5	9.7	3.6	3.4	.....
16	5.0	3.6	4.5	9.4	3.6	3.4	.....
17	5.2	3.5	4.7	8.3	3.6	3.4	.....
18	5.2	3.5	4.6	6.6	3.5	4.0	.....
19	5.1	3.4	4.4	6.1	3.5	6.9	.....
20	5.0	3.4	4.4	5.6	3.5	6.7	.....
21	5.0	3.4	4.4	5.3	3.4	5.3	.....
22	5.0	3.4	4.3	5.0	3.4	4.7	.....
23	5.4	3.4	4.3	5.1	3.4	4.6	.....
24	7.0	3.4	4.5	5.2	3.4	4.4	.....
25	7.1	3.6	4.3	4.8	3.4	4.2	.....
26	6.8	3.6	4.2	4.6	3.4	4.2	.....
27	6.0	3.7	4.2	4.3	3.6	4.0	.....
28	5.6	3.7	6.6	4.2	4.2	3.8	.....
29	5.4	.....	10.0	4.1	4.3	3.8	.....
30	5.0	.....	9.0	4.1	4.0	3.7	.....
31	4.8	.....	11.0	.....	3.6	.....	.....

Rating table for Juniata River at Newport, Pa., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.30	1,580	4.50	4,400	5.70	7,930	7.80	15,200
3.40	1,790	4.60	4,670	5.80	8,250	8.00	15,960
3.50	2,000	4.70	4,950	5.90	8,570	8.20	16,740
3.60	2,210	4.80	5,230	6.00	8,890	8.40	17,520
3.70	2,430	4.90	5,520	6.20	9,540	8.60	18,320
3.80	2,650	5.00	5,810	6.40	10,200	8.80	19,120
3.90	2,880	5.10	6,100	6.60	10,880	9.00	19,940
4.00	3,120	5.20	6,400	6.80	11,560	10.00	24,140
4.10	3,360	5.30	6,700	7.00	12,260	11.00	28,540
4.20	3,610	5.40	7,000	7.20	12,970		
4.30	3,870	5.50	7,310	7.40	13,700		
4.40	4,130	5.60	7,620	7.60	14,440		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1899–1906. It is well defined between gage heights 2.8 feet and 6.2 feet. The table has been extended beyond these limits, being based on one measurement at 8.2 feet. The table is the same as that for 1904 up to gage height 4 feet.

Monthly discharge of Juniata River at Newport, Pa., for 1906.

[Drainage area, 3,480 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	14,100	4,670	7,600	2.18	2.51
February	2,880	1,790	2,290	.658	.69
March	28,500	2,430	7,020	2.02	2.33
April	24,100	3,360	13,100	3.76	4.20
May	3,870	1,790	2,620	.753	.87
June	11,900	1,580	3,560	1.02	1.14
July 1-14	4,670	1,790	2,820	.810	.42

NOTE.—Values for entire year are excellent.

The following tables give the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge, and shows the number of days on which the flow and the corresponding horsepower were respectively less than the amounts given in the columns for "discharge" and "horsepower."

Discharge and horsepower table for Juniata River at Newport, Pa., from 1899–1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency per foot fall).	Number of days of deficient flow.							
		1899.[a]	1900.	1901.	1902.	1903.	1904.	1905.	1906.[b]
275	25	7	.....	.....	.....	.....	2	.....	.....
330	30	12	.....	.....	.....	.....	4	2	.....
385	35	12	.....	.....	.....	.....	4	2	.....
440	40	24	.....	.....	.....	.....	8	5	.....
495	45	24	.....	.....	.....	.....	8	5	.....
550	50	24	.....	.....	.....	.....	8	5	.....
660	60	36	39	.....	4	.....	18	10	.....
770	70	62	67	.....	20	.....	74	10	.....
880	80	62	67	.....	20	.....	89	10	.....
990	90	90	108	30	25	.....	94	11	.....
1,100	100	90	108	30	25	.....	94	11	.....
1,320	120	125	128	39	38	2	120	11	.....
1,540	140	136	141	50	64	11	136	24	.....
1,760	160	160	172	67	86	42	144	29	1
1,980	180	175	185	90	108	63	145	44	25
2,200	200	185	199	117	126	111	151	76	31
2,750	250	209	228	163	167	138	178	192	69

[a] March 21 to December 31. [b] January 1 to July 14.

NOTE.—From March 21, 1899, to July 14, 1906, the minimum flow was 230 second-feet, giving 21 horsepower per foot of fall, on 6 consecutive days in June, 1899, 1 day in July, 1899, November, 1903, and December, 1903.

BROAD CREEK AT MILL GREEN, MD.

This gaging station was established December 14, 1904. It is located in the village of Mill Green, on the steel highway bridge, and is best reached from Cardiff, Md. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 43.

Discharge measurements of Broad Creek at Mill Green, Md., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
June 23	Grover and Lyman	14.5	8.8	2.40	16.2
November 2	G. F. Harley	26	26	2.20	11.9
November 2	do	17	12.1	2.25	12.8
1906.					
March 17	Follansbee and Henshaw	31	38	2.48	27.0
March 30	F. F. Henshaw	29	41	2.63	34.9
April 10	do	32	51	2.96	61
April 10	do	32	51	2.92	55

Daily gage height, in feet, of Broad Creek at Mill Green, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.38	2.42	2.45	2.52	2.54	2.36	2.25	2.22	2.25	2.12	2.36	[illegible]
2	2.4	2.45	2.45	2.49	2.54	2.35	2.25	3.21	2.22	2.12	2.34	[illegible]
3	2.5	2.55	3.2	2.51	2.53	2.34	2.25	3.3	2.2	2.14	2.3	[illegible]
4	3.08	2.48	2.55	2.5	2.5	2.31	2.4	2.3	2.2	2.52	2.3	[illegible]
5	2.55	2.45	2.5	2.52	2.5	2.3	2.37	2.23	2.2	2.39	2.3	[illegible]
6	2.45	2.55	2.48	2.5	2.49	2.3	2.3	2.23	2.2	2.21	2.3	[illegible]
7	2.42	2.48	2.5	2.5	2.5	2.3	2.28	2.22	2.18	2.2	2.29	[illegible]
8	2.38	2.45	2.48	2.49	2.5	2.3	2.25	2.24	2.18	2.2	2.26	[illegible]
9	2.32	2.65	2.48	3.7	2.49	2.46	2.25	2.24	2.18	2.24	2.26	[illegible]
10	2.38	2.55	2.45	2.97	2.46	2.34	2.25	2.23	2.18	2.24	2.25	[illegible]
11	2.4	2.5	2.48	2.67	2.45	2.31	2.25	2.23	2.18	2.21	2.32	[illegible]
12	2.7	2.45	2.45	2.62	2.46	2.3	2.24	2.22	2.18	2.14	2.32	[illegible]
13	2.4	2.65	2.45	2.6	2.44	2.3	2.23	2.2	2.17	2.12	2.3	[illegible]
14	2.45	3.62	2.52	2.61	2.42	2.3	2.2	2.2	2.16	2.12	2.3	[illegible]
15	2.52	2.62	2.5	3.98	2.4	2.3	2.2	2.2	2.15	2.13	2.3	[illegible]
16	2.55	2.45	2.58	2.72	2.4	2.38	2.38	2.2	2.15	2.12	2.34	[illegible]
17	2.42	2.42	2.45	2.67	2.4	2.48	2.52	2.19	2.15	2.14	2.34	[illegible]
18	2.35	2.38	2.48	2.59	2.4	2.49	2.44	2.18	2.15	2.15	2.51	[illegible]
19	2.38	2.45	2.52	2.6	2.4	2.56	2.26	2.18	2.15	2.85	2.66	[illegible]
20	2.32	2.42	2.52	2.6	2.39	2.39	2.25	2.21	2.15	3.42	2.39	[illegible]
21	2.38	2.48	2.56	2.58	2.35	3.1	2.24	2.2	2.15	2.64	2.35	[illegible]
22	2.42	2.45	2.5	2.61	2.35	2.69	2.38	2.21	2.15	2.39	2.35	[illegible]
23	2.45	2.42	2.54	2.64	2.36	2.36	2.34	2.2	2.15	2.35	2.34	[illegible]
24	2.5	2.45	2.52	2.6	2.35	2.35	2.24	3.55	2.15	2.34	2.3	[illegible]
25	2.48	2.52	2.48	2.59	2.35	2.34	2.22	2.6	2.14	2.6	2.29	[illegible]
26	2.45	2.48	2.56	2.56	2.35	2.31	2.21	2.3	2.12	2.35	2.28	[illegible]
27	2.42	2.45	3.68	2.55	2.35	2.3	2.34	2.26	2.12	2.35	2.27	[illegible]
28	2.52	2.48	2.72	2.54	2.4	2.29	2.24	2.36	2.12	2.32	2.25	[illegible]
29	2.45	.....	2.59	2.55	2.36	2.26	2.46	2.44	2.13	2.3	2.24	[illegible]
30	2.45	.....	2.64	2.55	2.35	2.25	2.28	2.32	2.12	2.3	2.23	[illegible]
31	2.48	.....	2.76	.....	2.44	.....	2.22	2.28	.....	2.39	.....	[illegible]

Rating table for Broad Creek at Mill Green, Md., for 1904-1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	6	2.70	39	3.40	105	4.10	199
2.10	8	2.80	47	3.50	117	4.20	214
2.20	11	2.90	55	3.60	129	4.30	230
2.30	15	3.00	64	3.70	142	4.40	246
2.40	20	3.10	74	3.80	155	4.50	262
2.50	26	3.20	84	3.90	169	4.60	278
2.60	32	3.30	94	4.00	184	4.70	294

The above table is applicable only for open-channel conditions. It is based on 6 discharge nts made during 1905-6. It is well defined between gage heights 2.2 feet and 3.3 feet.

Monthly discharge of Broad Creek at Mill Green, Md., for 1904-6.

[Drainage area, 16.4 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
4-31	76	.....	15.0	0.915	0.61
1905.					
.....	184	.....	31.7	1.93	2.22
.....	60	.....	14.2	.866	.90
.....	187	29	54.2	3.30	3.80
.....	64	26	33.7	2.05	2.29
.....	84	16	23.6	1.44	1.66
.....	86	13	19.8	1.21	1.35
.....	246	11	29.3	1.79	2.06
.....	286	11	29.7	1.81	2.09
.....	49	13	16.1	.982	1.10
.....	111	8	16.0	.976	1.13
.....	45	9	13.0	.793	.88
.....	184	11	26.1	1.59	1.83
ear.....	286	.....	25.6	1.56	21.31
1906.					
.....	72	16	24.3	1.48	1.71
.....	132	19	28.9	1.77	1.84
.....	139	23	33.0	2.01	2.32
.....	181	25	40.3	2.46	2.74
.....	28	18	21.8	1.33	1.53
.....	74	13	20.1	1.23	1.37
.....	27	11	15.0	.915	1.05
.....	123	10	21.8	1.33	1.53
.....	13	9	9.9	.605	.67
.....	107	9	19.0	1.16	1.34
.....	36	12	16.4	1.00	1.12
.....	103	12	23.1	1.41	1.63
ear.....	181	9	22.8	1.39	18.85

Flow during ice periods was determined by comparison with flow at other eastern Maryland tions. Values are rated as follows: December, 1904, approximate, owing to ice conditions 14-26; January and February, 1905, fair, owing to ice conditions January 25 to February 23; 1905 and 1906, excellent; daily discharge above 180 second-feet, fair.

DEER CREEK NEAR CHURCHVILLE, MD.

station was established December 14, 1904. It is located at hway bridge on the Deer Creek road about 3 miles north of ville, and is best reached by driving from Belair. The con- at this station and the bench marks are described in Water- Paper No. 167, page 44, where are given also references to tions *that contain data for* previous years.

Discharge measurements of Deer Creek near Churchville, Md., 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	D cha
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
1904.					
November 8	N. C. Grover	70	86	1.48	
1905.					
June 23	Grover and Lyman	89	170	2.05	
November 2	G. F. Harley	89	150	1.81	
1906.					
March 17	Follansbee and Henshaw	91	185	2.20	
March 30	F. F. Henshaw	91	219	2.54	
April 10	do	92	282	3.11	

Daily gage height, in feet, of Deer Creek near Churchville, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	I
1	2.0	2.0	2.05	2.32	2.22	2.0	1.75	1.9	1.8	1.6	1.9	
2	1.9	1.9	2.05	2.28	2.2	1.95	1.8	1.95	1.75	1.6	1.95	
3	1.95	1.8	2.9	2.2	2.2	1.92	1.78	1.9	1.7	1.6	1.92	
4	3.25	2.0	3.4	2.22	2.18	1.9	3.1	1.92	1.7	1.82	1.92	
5	2.28	1.95	2.55	2.2	2.15	1.9	1.95	1.75	1.7	2.5	1.9	
6	2.2	1.98	2.38	2.2	2.25	1.9	1.92	1.85	1.7	1.95	1.9	
7	2.1	2.08	2.22	2.15	2.28	1.9	1.9	1.85	1.7	1.85	1.8	
8	2.1	1.92	2.32	3.7	2.22	1.9	1.9	1.85	1.7	1.75	1.75	
9	2.02	2.5	2.25	3.65	2.18	1.9	1.82	1.95	1.7	1.7	1.75	
10	2.02	2.35	2.1	2.72	2.18	2.35	1.82	1.9	1.7	1.7	1.75	
11	2.15	1.98	2.15	2.65	2.12	2.55	1.8	1.9	1.7	1.7	1.75	
12	2.32	2.08	2.12	2.45	2.1	1.98	1.82	1.8	1.7	1.7	1.75	
13	2.25	2.32	2.0	2.45	2.05	1.9	1.82	1.8	1.7	1.7	1.75	
14	2.25	2.15	2.15	2.45	2.05	1.9	1.8	1.85	1.7	1.7	1.75	
15	2.15	2.55	2.4	5.0	2.05	1.9	1.82	1.8	1.7	1.7	1.75	
16	3.3	2.15	2.22	2.8	2.05	2.2	1.8	1.8	1.68	1.65	1.75	
17	2.18	2.02	2.2	2.75	2.0	1.95	2.3	1.72	1.65	1.65	1.75	
18	2.12	2.22	2.1	2.55	2.0	2.9	1.95	1.75	1.6	1.65	1.7	
19	2.1	2.08	2.12	2.45	2.0	2.2	1.85	1.75	1.6	1.82	2.6	
20	1.95	2.08	2.25	2.45	2.0	2.02	2.3	1.8	1.6	3.25	1.88	
21	2.05	2.22	2.15	2.4	2.0	1.95	2.78	4.35	1.7	2.58	1.8	
22	2.05	2.32	2.18	2.4	2.0	3.2	2.75	1.95	1.68	2.2	1.75	
23	2.08	2.12	2.18	2.4	2.0	2.18	2.72	1.8	1.65	1.9	1.75	
24	2.28	2.12	2.1	2.35	2.0	2.3	2.2	1.78	1.6	1.9	1.72	
25	2.92	2.22	2.12	2.3	2.0	1.92	1.9	1.9	1.6	1.9	1.7	
26	2.0	2.2	2.2	2.3	2.0	1.9	2.0	1.9	1.6	1.95	1.7	
27	2.0	2.15	2.92	2.3	2.0	1.9	2.0	2.0	1.6	1.95	1.7	
28	2.35	1.88	2.82	2.3	2.3	1.9	3.2	1.9	1.6	1.95	1.7	
29	2.12	.....	2.5	2.28	2.3	1.88	3.45	1.9	1.6	1.9	1.7	
30	2.95	.....	2.52	2.25	2.1	1.8	2.4	1.95	1.6	1.9	1.7	
31	2.05	.....	2.52	.....	2.0	.....	1.9	1.85	.....	1.9	.....	

NOTE.—There was considerable slush ice February 3–16, but the figures obtained from the r table are probably not more than 10 per cent larger than the true values.

Rating table for Deer Creek near Churchville, Md., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.50	72	2.70	445	3.90	1,210	5.10	2,280
1.60	87	2.80	495	4.00	1,290	5.20	2,380
1.70	105	2.90	550	4.10	1,370	5.30	2,485
1.80	126	3.00	605	4.20	1,450	5.40	2,590
1.90	150	3.10	665	4.30	1,535	5.50	2,700
2.00	178	3.20	725	4.40	1,620	5.60	2,810
2.10	209	3.30	790	4.50	1,710	5.70	2,920
2.20	242	3.40	855	4.60	1,800	5.80	3,030
2.30	277	3.50	920	4.70	1,890	5.90	3,140
2.40	315	3.60	990	4.80	1,985	6.00	3,260
2.50	355	3.70	1,060	4.90	2,080		
2.60	400	3.80	1,135	5.00	2,180		

NOTE.—The above table is applicable only for open-channel conditions. It is based on six disc measurements made during 1904–1906. It is well defined between gage heights 1.5 feet and 3.5 fe

Monthly discharge of Deer Creek near Churchville, Md., for 1904-1906.

[Drainage area, 141 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
4-31	522	.....	130	0.922	0.62
1905.					
.....	3,200	.....	264	1.87	2.16
.....	695	.....	162	1.15	1.30
.....	955	164	377	2.67	3.08
.....	635	178	254	1.80	2.01
.....	296	105	153	1.09	1.26
.....	335	96	144	1.02	1.14
.....	495	96	162	1.15	1.33
.....	2,680	96	249	1.77	2.04
.....	920	105	194	1.38	1.54
.....	822	105	168	1.19	1.37
.....	323	105	130	.922	1.03
.....	2,230	115	265	1.88	2.17
ear	3,200	.....	210	1.49	20.33
1906.					
.....	790	150	273	1.94	2.24
.....	377	126	219	1.55	1.61
.....	855	178	301	2.13	2.46
.....	2,180	225	426	3.02	3.37
.....	277	178	211	1.50	1.73
.....	725	126	212	1.50	1.67
.....	887	115	251	1.78	2.05
.....	1,580	109	187	1.33	1.53
.....	126	87	99.2	.704	.79
.....	758	87	165	1.17	1.35
.....	400	105	132	.936	1.04
.....	1,140	105	243	1.72	1.98
ear	2,180	87	227	1.60	21.82

e flow during the frozen period of 1904 to 1905 was determined by intercomparison of flow laryland stations. Discharge computations for 1906 were not corrected for ice conditions ated as follows: December, 1904, approximate, owing to ice conditions December 14 to 27; l February, 1905, fair, owing to ice conditions January 27 to February 22; March, 1905, to 906, excellent; daily discharge above 2,000 second-feet, fair.

GUNPOWDER RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

eadwaters of Gunpowder River lie in York County, Pa., near yland line. Thence the river flows southeastward through re County, Md., and empties into Chesapeake Bay about 10 ortheast of Baltimore. The river, though small, has steep nd the powers have considerable value on account of their y to a large city. A portion of the water supply for Balti- taken from this river at Loch Raven, and the city has ed all the power rights below this place. Little Gunpowder hich is tributary below the fall line, has the same general ristics as the larger river. Throughout its entire length it e boundary between Harford and Baltimore counties, Md. e several small power developments.

GUNPOWDER FALLS AT GLENCOE, MD.

This station was established December 15, 1904. It is located at a steel highway bridge near the Pennsylvania Railroad station at Glencoe. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 46.

Discharge measurements of Gunpowder Falls at Glencoe, Md., in 1905 and 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 22	Grover and Lyman	66	93	1.53	138
November 3	F. F. Henshaw	66	89	1.80	138
1906.					
March 31	F. F. Henshaw	74	211	2.99	430
April 9	do	76	269	3.80	722
April 9	do	76	314	4.27	975

Daily gage height, in feet, of Gunpowder Falls at Glencoe, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	2.12	2.22	2.7	2.52	2.5	1.68	2.0	1.88	1.52	2.02	1.62
2	2.02	2.0	2.1	2.65	2.5	2.2	1.65	3.2	1.8	1.48	1.85	1.58
3	2.25	3.05	2.85	2.52	2.5	2.0	1.7	2.6	1.82	1.58	1.82	1.62
4	3.88	3.65	3.25	2.5	2.48	2.0	2.9	2.58	1.7	2.02	1.78	1.58
5	2.78	3.4	3.12	2.5	2.6	1.9	2.15	2.28	1.65	2.68	1.78	1.7
6	2.6	3.18	2.8	2.5	2.5	1.9	2.0	2.15	1.7	1.82	1.8	2.02
7	2.38	3.25	2.65	2.4	2.7	1.92	1.9	2.08	1.72	1.72	1.72	1.92
8	2.32	3.32	2.68	2.4	2.45	1.9	1.85	2.0	1.7	1.68	1.72	1.62
9	2.32	3.65	2.58	3.68	2.48	2.2	1.8	2.0	1.6	1.6	1.72	1.65
10	2.28	3.62	2.48	4.42	2.4	2.4	1.85	1.92	1.52	1.9	1.7	1.75
11	3.88	3.15	2.38	3.4	2.38	2.25	2.22	1.95	1.55	1.75	1.75	2.22
12	3.58	3.18	2.4	3.1	2.4	1.98	1.95	1.9	1.55	1.6	1.88	1.78
13	2.55	3.25	2.38	2.9	2.32	1.95	1.8	1.98	1.6	1.6	1.75	1.75
14	2.42	3.75	2.35	2.9	2.3	1.88	1.75	1.88	1.6	1.58	1.7	1.78
15	2.45	2.88	2.6	5.9	2.25	1.88	1.7	1.8	1.55	1.55	1.72	1.75
16	2.55	2.22	2.42	3.5	2.25	1.85	1.72	1.8	1.55	1.5	1.75	1.75
17	2.42	2.18	2.4	3.22	2.3	2.0	2.28	1.8	1.5	1.58	1.78	2.05
18	2.32	2.05	2.35	3.12	2.2	2.62	1.95	1.8	1.52	1.8	1.7	2.7
19	2.3	2.15	2.45	3.0	2.15	2.6	1.75	1.65	1.55	2.25	2.3	2.08
20	2.25	2.18	2.45	2.9	2.1	2.15	1.7	2.95	1.52	3.25	1.95	3.05
21	2.2	2.22	2.32	2.9	2.1	2.75	1.8	1.95	1.6	2.68	1.88	2.8
22	2.2	2.98	2.4	2.95	2.1	2.98	5.1	1.85	1.62	2.85	1.8	2.32
23	2.2	2.42	2.32	2.98	2.08	2.52	2.6	1.78	1.52	2.3	1.8	2.28
24	2.45	2.4	2.28	2.82	2.08	2.3	2.1	5.0	1.42	2.42	1.72	1.85
25	2.15	2.5	2.25	2.72	2.05	2.05	1.82	2.22	1.5	2.5	1.68	3.78
26	2.1	2.6	2.45	2.72	2.02	1.9	1.75	2.0	1.5	2.1	1.65	3.88
27	2.1	2.38	4.0	2.68	2.1	1.9	1.75	2.32	1.6	2.0	1.68	3.5
28	2.5	2.3	3.42	2.6	2.52	1.9	2.9	2.42	1.55	1.98	1.65	3.75
29	2.3	.....	2.98	2.55	2.4	1.8	3.4	2.28	1.55	1.9	1.6	3.32
30	2.12	.....	3.05	2.58	2.1	1.78	2.35	2.18	1.52	1.85	1.6	2.98
31	2.15	.....	3.02	.....	2.05	.....	2.08	1.95	.....	2.0	.....	3.05

NOTE.—Ice jam January 11-12, and February 3-5 and 13. River frozen over February 6-12. Ice jam December 24-30.

Rating tables for Gunpowder Falls at Glencoe, Md.

DECEMBER 15, 1904, TO AUGUST 25, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.30	100	2.40	335	3.50	730	4.00	1,240
1.40	114	2.50	365	3.60	770	4.70	1,295
1.50	130	2.60	395	3.70	810	4.80	1,350
1.60	147	2.70	430	3.80	855	4.90	1,405
1.70	166	2.80	465	3.90	900	5.00	1,460
1.80	186	2.90	500	4.00	945	6.00	2,070
1.90	207	3.00	535	4.10	990	7.00	2,740
2.00	230	3.10	570	4.20	1,040	8.00	3,440
2.10	254	3.20	610	4.30	1,090	9.00	4,160
2.20	280	3.30	650	4.40	1,140		
2.30	307	3.40	690	4.50	1,190		

[a] This table is applicable only for open-channel conditions. It is based on 1 discharge measurement made during 1905 and on the form of the 1905-6 curve.

AUGUST 26, 1905, TO DECEMBER 31, 1906.[b]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	77	2.80	375	4.20	910	5.60	1,650
1.50	90	2.90	407	4.30	955	5.70	1,710
1.60	104	3.00	440	4.40	1,000	5.80	1,770
1.70	119	3.10	475	4.50	1,050	5.90	1,835
1.80	135	3.20	510	4.60	1,100	6.00	1,900
1.90	152	3.30	545	4.70	1,150	6.10	1,965
2.00	170	3.40	580	4.80	1,200	6.20	2,030
2.10	190	3.50	620	4.90	1,255	6.30	2,095
2.20	212	3.60	660	5.00	1,310	6.40	2,160
2.30	235	3.70	700	5.10	1,365	6.50	2,230
2.40	260	3.80	740	5.20	1,420	6.60	2,300
2.50	286	3.90	780	5.30	1,475		
2.60	314	4.00	820	5.40	1,530		
2.70	344	4.10	865	5.50	1,590		

[b] This table is applicable only for open-channel conditions. It is based on 4 discharge measurements made during 1905 and 1906. It is fairly well defined between gage heights 1.8 feet and 5 feet.

NOTE.—At times of measurements the error in discharge determinations may be less than 5 per cent, other times it may be as much as 25 per cent at low stages, and 10-15 per cent at high stages for short periods.

Monthly discharge of Gunpowder Falls at Glencoe, Md., for 1904-1906.

[Drainage area, 160 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
...ember 15-31	.....	.....	150	0.938	0.59
1905.					
...uary	3,510	.....	311	1.94	2.24
...ruary	.....	.....	150	.938	.98
...rch	1,140	.....	463	2.89	3.33
...il	810	203	298	1.86	2.08
...	242	114	172	1.08	1.24
...e	602	114	192	1.20	1.34
...	670	111	240	1.50	1.73
...gust	3,940	147	361	2.26	2.61
...tember	820	107	218	1.36	1.52
...ober	1,270	93	211	1.32	1.52
...vember	503	111	147	.919	1.03
...ember	2,260	143	310	1.94	2.24
The year	3,940	93	256	1.60	21.86

Monthly discharge of Gunpowder Falls at Glencoe, Md., for 1904–1906—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1906.					
January	772	174	255	1.59	1.83
February	720	170	268	1.68	1.73
March	820	190	330	2.06	2.38
April	1,840	260	461	2.88	3.21
May	344	174	239	1.49	1.72
June	433	132	205	1.28	1.43
July	1,360	111	227	1.42	1.64
August	1,310	111	237	1.48	1.71
September	149	80	104	.650	.72
October	527	86	179	1.12	1.29
November	235	104	132	.825	.92
December	457	101	203	1.27	1.46
The year	1,840	80	237	1.48	20.06

NOTE.—The discharge during the frozen periods was determined by intercomparison of data collected at eastern Maryland gaging stations.

Values for December, 1904, are approximate, owing to ice conditions. Values for January to August, 1905, are fair. Values from September, 1905, to December, 1906, are good. Ice conditions, December, 1904, January 1-6, and January 15 to March 4, 1905. For 1906 ice conditions see footnote to gage heights.

LITTLE GUNPOWDER FALLS NEAR BELAIR, MD.

This station was established December 13, 1904. It is located at a steel highway bridge on the road from Belair to Kingsville, at a distance of about 5 miles from Belair, from which place it is best reached by driving. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 48, where are given also references to publications that contain data for previous years.

Discharge measurements of Little Gunpowder Falls near Belair, Md., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 22	Grover and Lyman	33	32	1.50	48.9
November 1	G. F. Harley	38	47	1.39	44.5
1906.					
March 16	Follansbee and Henshaw	39	69	1.95	91
March 31	F. F. Henshaw	39	71	1.98	101
April 11	do	40	73	2.09	127

Daily gage height, in feet, of Little Gunpowder Falls near Belair, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.52	1.68	1.78	1.86	1.84	2.09	1.54	1.56	1.56	1.47	1.71	1.[illegible]
2	1.55	1.58	1.62	1.76	1.88	1.78	1.55	2.16	1.58	1.45	1.56	1.[illegible]
3	1.6	1.75	2.18	1.76	1.88	1.69	1.49	2.08	1.59	1.44	1.56	1.[illegible]
4	2.55	1.85	2.52	1.82	1.83	1.66	2.04	1.66	1.54	1.92	1.59	1.[illegible]
5	1.82	1.65	1.88	1.75	1.94	1.68	1.64	1.6	1.5	2.32	1.58	1.[illegible]
6	1.72	1.9	1.75	1.84	2.0	1.68	1.52	1.52	1.46	1.66	1.56	1.[illegible]
7	1.6	1.92	1.8	1.81	1.89	1.62	1.58	1.6	1.4	1.59	1.53	1.[illegible]
8	1.68	2.0	1.78	1.76	1.86	1.7	1.53	1.38	1.48	1.52	1.52	1.[illegible]
9	1.62	2.3	1.78	3.18	1.85	1.64	1.43	1.5	1.5	1.48	1.55	1.[illegible]
10	1.85	2.02	1.75	2.9	1.79	1.95	1.52	1.49	1.5	1.68	1.58	1.[illegible]
11	1.9	1.85	1.7	2.04	1.84	1.88	1.45	1.46	1.46	1.5	1.7	1.[illegible]
12	2.1	1.82	1.7	1.94	1.81	1.6	1.53	1.49	1.53	1.43	1.64	1.[illegible]
13	1.85	2.1	1.7	1.86	1.79	1.66	1.54	1.85	1.5	1.58	1.57	1.[illegible]
14	1.88	2.48	1.68	1.88	1.78	1.62	1.5	1.62	1.49	1.49	1.6	1.[illegible]
15	1.8	2.2	2.05	4.18	1.79	1.63	1.49	1.52	1.42	1.45	1.62	1.[illegible]

y gage height, in feet, of Little Gunpowder Falls near Belair, Md., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	1.88	1.78	1.9	2.24	1.8	1.68	1.49	1.46	1.46	1.48	1.63	1.62
.....	1.78	1.75	1.85	2.09	1.72	1.65	2.22	1.45	1.48	1.46	1.6	2.42
.....	1.68	1.75	1.82	2.02	1.78	2.42	1.64	1.42	1.46	1.46	1.58	1.98
.....	1.7	1.68	1.88	1.95	1.72	2.05	1.58	1.5	1.44	1.99	2.52	1.75
.....	1.65	1.65	1.88	1.95	1.7	1.79	1.46	3.34	1.42	2.5	1.88	2.7
.....	1.65	1.68	1.85	1.95	1.66	1.72	1.52	2.06	1.62	2.39	1.76	2.09
.....	1.58	1.95	1.85	1.94	1.64	2.0	2.42	2.8	1.42	1.84	1.72	1.94
.....	1.65	1.68	1.88	1.92	1.69	1.71	1.68	1.75	1.46	1.65	1.65	1.82
.....	1.92	1.75	1.8	1.92	1.64	1.82	1.51	1.62	1.46	1.65	1.64	1.82
.....	1.62	1.78	1.78	1.88	1.69	1.64	1.48	1.85	1.4	2.26	1.61	2.56
.....	1.62	1.68	1.95	1.89	1.72	1.56	1.4	1.74	1.36	1.72	1.67	2.56
.....	1.58	1.7	2.62	1.89	1.73	1.62	1.52	1.96	1.46	1.64	1.61	1.76
.....	1.85	1.75	2.18	1.86	1.9	1.56	1.48	2.06	1.46	1.64	1.62	1.7
.....	1.65	.....	1.92	1.86	1.88	1.56	2.19	2.08	1.36	1.55	1.5	1.8
.....	1.68	.....	1.9	1.9	1.74	1.54	1.69	1.8	1.42	1.53	1.59	1.71
.....	1.65	.....	1.95	.....	2.49	.....	1.56	1.61	.....	1.66	.....	2.71

: Probable backwater, December 25-26.

Rating table for Little Gunpowder Falls near Belair, Md., for 1904-1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	19	2.00	103	2.80	263	3.60	480
1.30	26	2.10	119	2.90	288	3.70	510
1.40	34	2.20	136	3.00	314	3.80	540
1.50	43	2.30	155	3.10	340	3.90	570
1.60	53	2.40	175	3.20	367	4.00	600
1.70	64	2.50	195	3.30	394	4.10	630
1.80	76	2.60	216	3.40	422	4.20	660
1.90	89	2.70	239	3.50	450		

.—The above table is applicable only for open-channel conditions. It is based on 6 discharge ements made during 1904-1906. It is well defined between gage heights 1.4 feet and 2.2 feet. At f measurements the error in discharge determinations may be less than 5 per cent, but at other may be 10 to 15 per cent, owing to shifting of channel.

Monthly discharge of Little Gunpowder Falls near Belair, Md., for 1904-1906.

[Drainage area, 43 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
r 13-31	.....	.....	40.0	0.930	0.66
1905.					
.....	486	.....	75.5	1.76	2.03
.....	175	.....	50.2	1.17	1.22
.....	416	74	127	2.95	3.40
.....	195	62	80.5	1.87	2.09
.....	89	41	58.9	1.37	1.58
.....	171	30	55.1	1.28	1.43
.....	444	32	80.0	1.86	2.14
.....	136	25	41.6	.967	1.11
r.....	165	32	44.6	1.04	1.16
.....	116	26	44.0	1.02	1.18
r.....	136	20	42.2	.981	1.09
r.....	630	26	74.7	1.74	2.01
e year.....	630	20	64.5	1.50	20.44

Monthly discharge of Little Gunpowder Falls near Belair, Md., for 1904-1906—Cont'd.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1906.					
January	205	45	71.7	1.67	[illegible]
February	191	51	84.6	1.97	[illegible]
March	221	55	91.1	2.12	[illegible]
April	654	70	124	2.88	[illegible]
May	193	57	79.3	1.84	[illegible]
June	179	47	70.8	1.65	[illegible]
July	179	34	58.4	1.36	[illegible]
August	405	32	82.4	1.92	[illegible]
September	55	31	39.4	.916	[illegible]
October	195	37	67.9	1.58	[illegible]
November	199	43	60.0	1.40	[illegible]
December	241	42	83.5	1.94	[illegible]
The year	654	31	76.1	1.77	[illegible]

NOTE.—The discharge during the frozen period was determined by intercomparison of data collected at eastern Maryland gaging stations.

Values for December, 1904, are approximate, owing to ice conditions. Values for 1905 and 1906 are fair, except those for March and April, 1906, which are good. Ice conditions December, 1904, January 1 to 6 and January 26 to February 25, 1905, and December 25 and 26, 1906.

PATAPSCO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Patapsco River is formed by the junction of North Branch and South or Piney Branch near Marriottsville, Md., and flows in a southeasterly direction into Chesapeake Bay, 13 miles south of Baltimore. Both branches rise in the central part of Maryland, and the whole basin, which has an area of about 350 square miles, lies within that State.

The drainage basin is hilly and largely under cultivation. It has no lakes or artificial reservoirs, and the flow of the stream is variable. The maximum estimated flow at the gaging station at Woodstock, Md., where the drainage area is 251 square miles, is about 12,000 second-feet, while the minimum estimated flow has been about 50 second-feet. The record from which these estimates have been taken extends over a period of nine and one-half years. The freshets do not, however, cause very large rises of the water because of the steep slope of the stream. The maximum recorded difference in gage height at Woodstock is 13 feet, while the usual range within a year is about 3 or 4 feet.

The bed is generally rock. The banks are of rock and very little land is subject to overflow. The Baltimore and Ohio Railroad follows the stream closely throughout nearly its entire length.

The river carries a small volume of water, but as it has considerable slope a large number of water powers have been developed along its course. These, though small, are made valuable by their proximity to Baltimore.

PATAPSCO RIVER AT WOODSTOCK, MD.

This station was established August 6, 1896. It is located near the ilroad station at Woodstock, 1.5 miles below the mouth of the orth Branch. The conditions at this station and the bench marks e described in Water-Supply Paper No. 167, page 49, where are en also references to publications that contain data for previous rs.

Daily gage height, in feet, of Patapsco River at Woodstock, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.2	4.2	4.15	4.6	4.35	4.05	4.0	3.9	4.25	4.1	3.9	4.0
.....	4.1	4.2	4.2	4.5	4.4	4.0	3.9	12.5	4.3	3.95	3.95	4.05
.....	4.2	4.05	5.7	4.4	4.45	3.85	3.95	6.9	4.25	3.85	3.8	4.15
.....	5.75	4.15	6.6	4.35	4.35	3.9	6.55	4.75	4.15	4.15	3.95	4.1
.....	4.65	4.2	4.75	4.35	4.8	3.95	4.6	4.3	4.15	5.05	3.9	3.95
.....	4.45	4.85	4.55	4.35	4.35	3.9	4.1	4.35	4.05	4.5	4.0	4.15
.....	4.3	4.6	4.45	4.3	4.35	3.85	3.9	4.15	4.15	4.3	4.0	4.0
.....	4.3	4.3	4.5	4.35	4.4	3.85	3.9	4.2	4.0	4.15	3.9	4.1
.....	4.2	4.85	4.4	4.55	4.3	3.95	4.05	4.1	4.0	4.0	3.85	4.15
.....	4.15	4.35	4.3	4.45	4.25	3.9	4.1	4.05	4.1	4.2	4.0	4.15
.....	4.2	4.05	4.25	4.35	4.25	4.3	4.0	4.2	4.05	4.05	4.0	4.45
.....	4.5	4.1	4.2	4.4	4.3	4.15	4.0	4.45	3.95	3.9	3.95	4.15
.....	4.4	4.25	4.2	4.45	4.25	4.05	3.95	4.55	4.0	3.8	3.9	4.15
.....	4.4	4.55	4.3	4.35	4.15	3.95	3.85	4.05	3.9	3.85	3.85	4.05
.....	4.45	4.6	4.9	9.45	4.15	3.9	3.8	3.95	4.15	3.95	3.95	4.05
.....	4.45	4.1	4.6	5.3	4.2	3.85	3.95	4.05	4.05	3.9	3.95	4.35
.....	4.3	4.05	4.45	5.0	4.15	4.05	4.0	4.0	4.0	4.25	4.0	5.8
.....	4.3	4.05	4.35	4.85	4.05	4.45	4.1	4.25	3.95	4.05	4.15	4.95
.....	4.25	4.1	4.35	4.75	4.05	4.4	4.0	4.15	3.9	4.45	4.9	4.65
.....	4.2	4.15	4.45	4.7	4.05	4.45	3.85	4.3	4.1	5.65	4.6	4.6
.....	4.2	4.25	4.3	4.65	4.05	4.95	3.8	4.25	4.05	7.2	4.45	4.8
.....	4.2	4.6	4.35	4.65	4.1	4.65	4.2	4.1	4.2	5.1	4.25	4.6
.....	4.2	4.25	4.4	4.6	4.1	4.4	4.65	4.05	4.0	4.25	4.05	4.55
.....	4.25	4.2	4.3	4.5	3.95	4.45	4.15	9.5	3.95	4.35	4.1	4.4
.....	4.15	4.15	4.35	4.6	4.0	4.25	3.9	6.5	3.85	4.2	4.15	4.35
.....	4.15	4.4	4.4	4.5	4.0	4.05	3.75	5.75	4.1	4.25	4.1	4.2
.....	4.15	4.25	5.05	4.55	4.05	3.95	3.95	5.9	3.95	3.95	4.05	4.35
.....	4.35	4.25	5.15	4.5	4.7	3.9	4.7	5.35	4.0	3.9	4.1	4.25
.....	4.2	.....	4.75	4.45	4.3	3.9	4.4	4.65	3.9	3.85	4.15	4.2
.....	4.15	.....	4.85	4.45	4.15	3.85	4.05	4.45	3.95	3.8	4.05	4.25
.....	4.2	.....	4.85	.....	4.15	.....	3.95	4.4	.....	3.95	.....	5.4

Rating table for Patapsco River at Woodstock, Md., for 1904 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.20	36	4.20	332	5.20	1,026	7.00	2,778
3.30	50	4.30	383	5.30	1,115	7.50	3,273
3.40	66	4.40	438	5.40	1,206	8.00	3,772
3.50	86	4.50	497	5.50	1,300	8.50	4,278
3.60	111	4.60	561	5.60	1,396	9.00	4,788
3.70	139	4.70	629	5.70	1,493	10.00	5,818
3.80	170	4.80	701	5.80	1,591	11.00	6,858
3.90	204	4.90	777	5.90	1,689	12.00	7,908
4.00	242	5.00	857	6.00	1,788		
4.10	285	5.10	940	6.50	2,283		

NOTE.—The above table is applicable only for open-channel conditions. It is based on six discharge measurements made during 1904 and 1905. It is well defined.

Monthly discharge of Patapsco River at Woodstock, Md., for 1906.

[Drainage area, 251 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	1,540	285	410	1.63	1.8[illegible]
February	739	264	388	1.55	1.6[illegible]
March	2,380	308	596	2.37	2.7[illegible]
April	5,250	383	692	2.76	3.0[illegible]
May	701	223	355	1.41	1.6[illegible]
June	817	187	303	1.21	1.3[illegible]
July	2,330	155	341	1.36	1.5[illegible]
August	8,440	204	1,020	4.08	4.7[illegible]
September	383	187	264	1.05	1.1[illegible]
October	2,980	170	446	1.78	2.0[illegible]
November	777	170	281	1.12	1.2[illegible]
December	1,590	223	452	1.80	2.0[illegible]
The year	8,440	155	463	1.84	25.[illegible]

NOTE.—Values for entire year are excellent.

The following table gives the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge and shows the number of days on which the flow and the corresponding horsepower were respectively less than the amounts given in the columns for "discharge" and "horsepower:"

Discharge and horsepower table for Patapsco River at Woodstock, Md., from 1896 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.										
		1896.[a]	1897.	1898.	1899.[b]	1900.[c]	1901.[d]	1902.	1903.	1904.	1905.	1906.
55	5	.....	.....	.....	.....	10	.....	.....	.....	2	.....	.....
66	6	1	1	1	.....	17	.....	.....	.....	12	.....	.....
88	8	6	7	8	3	24	1	.....	.....	77	.....	.....
110	10	22	18	18	5	34	6	1	.....	112	.....	.....
132	12	41	38	53	11	48	22	10	.....	161	9	.....
154	14	96	64	87	27	85	47	51	.....	184	26	.....
176	16	106	88	121	67	108	77	73	.....	222	92	6
198	18	120	101	127	89	120	93	82	2	241	114	19
220	20	126	116	151	134	134	127	110	6	257	145	40
275	25	133	158	202	175	178	179	174	44	325	220	120

[a] August 16 to December 31.
[b] February 1 to December 31.
[c] January 1 to November 30.
[d] Omitting September.

NOTE.—During the period covered by this table the minimum flow was 50 second-feet, giving 4.5 horsepower per foot of fall on two days in July, 1900, eight days in August, 1900, and one day each in June and September, 1904.

POTOMAC RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Potomac River is formed by the junction of its north and south branches, about 15 miles below Cumberland, Md., from which point it flows in a southeasterly direction into Chesapeake Bay. For its entire length it forms the southern boundary of the State of Maryland

The Great Falls of the Potomac, located about 15 mil Washington (as shown in Pl. IV), offers one of the best und power sites along Potomac River.

The surface water resources of the Potomac River basin h discussed in detail in Water-Supply Paper No. 192.

NORTH BRANCH OF POTOMAC RIVER AT PIEDMONT, W.

This station was established June 27, 1899, and was disc July 15, 1906. It is located at the iron highway bridge co Luke, Md., with Piedmont, W. Va. The conditions at thi and the bench marks are described in Water-Supply Paper page 53, and in Water-Supply Paper No. 192, where are giver data for previous years.

Discharge measurements of North Branch of Potomac River at Piedmont, W. V

Date.	Hydrographer.	Width.	Area of section.	Gag heigh
		Feet.	*Sq. ft.*	*Feet*
March 16	Bolster and Padgett	146	243	3.
March 30	Robert Follansbee	291	1,220	7.
April 11	R. H. Bolster	284	787	5.
May 28	Robert Follansbee	147	243	3.

Daily gage height, in feet, of North Branch of Potomac River at Piedmont, W. V

Day.	Jan.	Feb.	Mar.	Apr.	May.	Ju
1	3.55	3.65	2.75	6.05	4.0	
2	3.35	3.55	3.1	5.55	3.9	
3	3.65	3.2	3.3	5.7	4.0	
4	5.65	3.4	5.15	6.0	3.8	
5	5.3	3.5	4.35	6.15	3.7	
6	4.6	3.0	3.95	6.8	3.6	
7	3.9	3.1	3.8	5.7	3.7	
8	4.05	3.1	3.8	5.05	3.6	
9	3.65	3.1	3.7	5.15	3.5	
10	3.55	2.9	3.6	6.45	3.5	
11	3.55	2.75	3.4	5.5	3.4	
12	3.7	2.85	3.6	5.45	3.4	
13	3.95	3.0	3.5	4.55	3.3	
14	3.8	3.05	3.5	4.45	3.2	
15	3.8	3.0	3.5	6.15	3.2	
16	3.95	2.75	3.5	5.45	3.1	
17	4.15	2.8	3.4	4.85	3.1	
18	4.1	2.9	3.15	4.45	3.0	
19	4.7	2.8	3.4	4.25	3.0	
20	4.35	2.95	4.05	4.1	2.9	
21	4.5	3.0	3.8	3.95	2.9	
22	4.85	3.2	3.7	4.0	2.8	
23	8.2	3.1	3.7	4.0	2.8	
24	6.4	3.05	3.75	4.0	2.7	
25	5.1	3.1	3.55	4.1	2.7	
26	4.6	3.1	3.6	6.5	2.7	
27	4.35	3.05	5.05	5.4	2.7	
28	4.3	2.6	7.3	4.65	3.35	
29	4.15	.....	6.25	4.35	3.45	
30	3.95	.....	7.4	4.15	3.2	
31	3.8	.....	7.4	.....	3.0	...

NOTE.—Discharge probably unaffected by ice during 1906.

Rating table for North Branch of Potomac River at Piedmont, W. Va., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.50	70	3.70	519	4.90	1,655	6.20	3,450
2.60	88	3.80	587	5.00	1,770	6.40	3,785
2.70	109	3.90	661	5.10	1,890	6.60	4,140
2.80	133	4.00	740	5.20	2,015	6.80	4,515
2.90	160	4.10	825	5.30	2,140	7.00	4,900
3.00	190	4.20	915	5.40	2,270	7.20	5,300
3.10	224	4.30	1,010	5.50	2,400	7.40	5,710
3.20	262	4.40	1,110	5.60	2,535	7.60	6,130
3.30	304	4.50	1,215	5.70	2,675	7.80	6,570
3.40	350	4.60	1,320	5.80	2,820	8.00	7,030
3.50	401	4.70	1,430	5.90	2,970	8.20	7,500
3.60	457	4.80	1,540	6.00	3,125		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 3 discharge measurements made during 1906, and on the form of previous curves. It is well defined between gage heights 3.5 feet and 5.5 feet.

Monthly discharge of North Branch of Potomac River at Piedmont, W. Va., for 1906.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	7,500	327	1,260	3.06	3.53
February	488	88	220	.537	.56
March	5,710	121	1,160	2.83	3.26
April	4,520	700	2,010	4.91	5.48
May	740	109	323	.788	.91
June	2,080	160	413	1.01	1.13
July 1-15	224	70	120	.293	.16

NOTE.—Values are rated as follows: January, February, and July, good; March to June, excellent.

POTOMAC RIVER AT POINT OF ROCKS, MD.

This station was established February 17, 1895. It is located at the steel highway bridge at Point of Rocks, Md. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 55, and in Water-Supply Paper No. 192, where are given also the data for previous years.

Discharge measurements of Potomac River at Point of Rocks, Md., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 30	Robert Follansbee	987	3,350	1.70	3,890
December 7 [a]	Bolster and Padgett	990	3,180	1.76	4,450

[a] Results not reliable, owing to heavy gale blowing downstream.

Daily gage height, in feet, of Potomac River at Point of Rocks, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1	3.6	3.0	1.9	11.1	3.3	1.8	2.2	1.6	3.7	1.2	2.6	1
2	3.4	2.9	1.8	9.6	3.1	1.7	1.9	1.5	3.1	1.2	2.5	1
3	3.3	2.7	1.8	7.7	2.8	1.7	2.0	1.5	2.8	1.4	2.3	1
4	3.7	2.5	2.0	6.5	2.8	1.6	2.9	4.3	2.6	1.5	2.3	1
5	8.0	2.4	4.0	5.5	2.6	1.5	2.6	3.6	2.3	2.2	2.1	1
6	8.6	2.2	5.45	5.1	2.5	1.7	2.4	2.8	2.1	2.5	2.1	1
7	7.0	2.2	4.5	4.8	2.6	1.9	2.2	2.4	1.9	2.7	2.1	1
8	4.8	2.0	3.6	4.8	2.5	1.7	2.0	2.6	1.8	2.6	2.0	1
9	4.0	1.9	3.0	4.3	2.4	2.4	1.9	2.8	1.8	2.5	2.0	1
10	3.5	1.8	2.7	4.2	2.4	3.0	1.7	3.2	1.7	2.2	1.9	1
11	3.1	1.8	2.6	5.5	2.4	2.5	1.5	7.6	1.7	2.0	1.8	2
12	2.9	1.9	2.5	5.6	2.2	2.2	1.4	5.7	1.6	1.9	1.8	2
13	2.8	1.8	2.3	4.9	2.3	1.8	1.3	4.3	1.6	1.6	1.8	3
14	3.0	1.8	2.3	4.0	2.2	1.6	1.2	3.7	1.5	1.5	1.7	3
15	3.3	1.9	2.3	5.75	2.0	1.6	1.3	3.0	1.5	1.6	1.8	2
16	3.6	1.8	2.4	8.45	2.1	1.6	1.2	5.1	1.4	1.4	1.7	2
17	3.7	1.7	2.5	7.5	2.0	1.6	1.2	4.8	1.6	1.4	1.8	2
18	4.1	1.6	2.5	6.3	1.8	2.5	1.5	4.2	1.5	1.5	1.8	4
19	3.9	1.6	2.6	5.1	1.9	3.2	1.8	3.5	1.4	1.7	1.9	10
20	3.5	1.6	2.9	4.5	1.8	2.9	1.7	4.4	1.4	12.5	1.9	7
21	3.4	1.7	2.9	4.1	1.6	3.1	1.5	4.0	1.4	16.1	3.0	5
22	3.3	1.8	3.1	3.6	1.6	5.0	1.4	5.3	1.3	11.65	4.2	5
23	3.2	1.9	3.4	3.3	1.6	4.3	1.5	4.8	1.3	8.5	4.0	4
24	3.1	2.0	3.9	3.1	1.4	3.6	2.0	3.7	1.3	6.6	3.3	3
25	6.35	2.0	3.9	2.9	1.5	3.1	2.1	4.1	1.3	5.4	3.0	3
26	5.1	1.9	3.9	2.9	1.4	2.6	1.9	4.8	1.3	4.5	2.7	2
27	4.2	1.8	3.7	2.8	1.3	2.4	1.7	4.6	1.2	4.1	2.6	2
28	3.6	2.0	7.8	5.1	1.9	2.3	1.8	6.7	1.2	3.6	2.2	2
29	3.4	.....	12.9	5.0	1.9	3.1	1.9	6.0	1.2	3.3	2.1	3
30	3.2	.....	10.5	4.3	1.7	3.0	2.0	5.3	1.2	3.1	2.1	3
31	3.1	.....	10.9	.....	1.7	.....	1.7	4.4	.....	2.8	.....	3

NOTE.—Practically no ice conditions.

Rating table for Potomac River at Point of Rocks, Md., for 1902-1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	2,530	2.60	7,330	4.00	14,070	6.80	31,460
1.30	2,810	2.70	7,750	4.20	15,150	7.00	32,820
1.40	3,100	2.80	8,180	4.40	16,270	8.00	39,980
1.50	3,400	2.90	8,620	4.60	17,430	9.00	47,600
1.60	3,700	3.00	9,070	4.80	18,610	10.00	55,600
1.70	4,010	3.10	9,530	5.00	19,820	11.00	63,900
1.80	4,330	3.20	10,000	5.20	21,060	12.00	72,200
1.90	4,670	3.30	10,480	5.40	22,300	13.00	80,500
2.00	5,020	3.40	10,970	5.60	23,560	14.00	88,800
2.10	5,380	3.50	11,470	5.80	24,840	15.00	97,100
2.20	5,750	3.60	11,980	6.00	26,140	16.00	105,400
2.30	6,120	3.70	12,490	6.20	27,460	17.00	113,700
2.40	6,520	3.80	13,010	6.40	28,780		
2.50	6,920	3.90	13,530	6.60	30,100		

NOTE.—The above table is applicable only for open-channel conditions. It is based on disch measurements made during 1902-1906, inclusive. It is well defined between gage heights 1 foot an feet. Above gage height 10 feet the rating curve is a tangent, the difference being 830 per tenth. above table supersedes previous tables, from April 1, 1902, to December 31, 1906.

Monthly discharge of Potomac River at Point of Rocks, Md., for 1906.

[Drainage area, 9,650 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	44,500	8,180	15,000	1.55	1.79
February	9,070	3,700	5,120	.530	.55
March	79,700	4,330	15,900	1.65	1.90
April	64,700	8,180	22,400	2.33	2.60
May	10,500	2,810	5,540	.574	.66
June	19,800	3,400	7,010	.726	.81
July	8,620	2,530	4,380	.454	.52
August	37,100	3,400	15,200	1.58	1.82
September	12,500	2,530	4,280	.444	.50
October	106,000	2,530	16,300	1.69	1.95
November	15,200	4,010	6,340	.657	.73
December	55,600	4,010	11,000	1.14	1.31
The year	106,000	2,530	10,700	1.11	15.14

NOTE.—Values for entire year are excellent.

The following table gives the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge, and shows the number of days on which the flow and the corresponding horsepower were, respectively, less than the amounts given in the columns for "discharge" and "horsepower."

Discharge and horsepower table for Potomac River at Point of Rocks, Md., from 1895 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency), per foot fall.	Number of days of deficient flow.											
		1895.[a]	1896.[b]	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
990	90	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....
1,100	100	5	.....	.....	.....	.....	3	.....	.....	.....	23	.....	.....
1,320	120	40	14	.....	.....	.....	39	.....	12	.....	58	.....	.....
1,540	140	79	28	3	.....	.....	78	.....	25	.....	86	.....	.....
1,760	160	107	43	9	6	23	101	.....	51	.....	107	14	.....
1,980	180	124	60	29	8	50	110	2	51	.....	107	14	.....
2,200	200	128	72	56	29	82	115	5	83	22	126	32	.....
2,750	250	150	101	98	59	133	140	49	109	59	140	46	9
3,300	300	162	130	107	71	152	152	60	142	74	161	90	28
3,850	350	182	162	137	95	172	173	88	162	103	196	130	59
4,400	400	190	187	162	106	176	193	101	175	128	207	149	106
4,950	450	201	222	186	128	188	223	126	185	139	210	162	128
5,500	500	208	238	195	136	197	233	133	195	161	233	195	151

[a] February 17 to December 31.
[b] Flow for missing days estimated from Millville records.

NOTE.—During the period covered by this table the minimum flow was 900 second-feet, giving 82 horsepower per foot of fall, on 6 days (two 3-day periods) in October, 1904.

SOUTH BRANCH OF POTOMAC RIVER NEAR SPRINGFIELD, W. VA.

A gaging station was established at the Baltimore and Ohio Railroad bridge, 3 miles southwest of Springfield, in April, 1894. This station was discontinued in 1896 for want of an observer. On June 26, 1899, a station was established at the highway bridge 1.5 miles

below the original station, near Grace station. This bridge wa: ried away by flood in February, 1902. The present station established August 28, 1903, and was discontinued July 14, It is located at the steel highway bridge, 2.5 miles east of Sp field, W. Va. The conditions at this station and the bench n are described in Water-Supply Paper No. 167, page 60, and in W Supply Paper No. 192, where are given also the data for pre years.

Discharge measurements of South Branch of Potomac River near Springfield, W. 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	c
		Feet.	*Sq.-ft.*	*Feet.*	
March 17 [a]	Bolster and Padgett	146	620	4.50	
May 26	Robert Follansbee	146	346	2.63	

[a] Measurement may have been affected by ice about the pivot point of the meter.

Daily gage height, in feet, of South Branch of Potomac River near Springfield, W for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	4.0	4.05	2.6	9.65	4.85	2.8
2	3.95	3.85	2.7	8.75	4.55	2.7
3	3.85	3.55	2.8	7.85	4.35	2.7
4	6.75	3.4	7.05	6.25	4.2	2.8
5	8.65	3.4	6.65	5.3	4.0	2.7
6	6.7	3.2	5.65	5.4	4.15	2.7
7	5.3	3.05	4.8	5.15	3.9	2.85
8	4.6	3.0	4.35	4.95	4.0	2.85
9	4.15	3.0	4.05	4.65	3.85	2.85
10	3.75	3.1	3.85	5.35	3.7	2.85
11	3.6	2.9	3.65	5.45	3.65	2.65
12	3.9	2.9	3.5	5.15	3.4	2.5
13	4.3	2.85	3.35	4.75	3.3	2.58
14	4.5	2.7	3.3	4.4	3.25	2.4
15	4.55	2.7	3.65	5.4	3.2	2.5
16	5.15	2.7	4.25	6.6	3.4	2.7
17	5.2	2.6	4.45	5.9	3.3	2.7
18	4.75	2.5	4.4	5.5	3.2	2.75
19	4.45	2.4	4.4	4.85	3.1	2.9
20	4.05	2.4	4.8	4.45	3.0	3.0
21	3.85	2.6	5.15	4.0	3.05	3.85
22	3.75	2.65	5.65	3.85	2.85	4.0
23	5.15	2.7	6.1	3.75	2.75	3.65
24	9.5	2.6	5.95	3.65	2.7	3.35
25	7.2	2.6	5.35	3.6	2.6	3.5
26	5.25	2.6	5.6	6.35	2.6	4.2
27	4.85	2.6	8.65	9.85	2.5	4.1
28	4.65	2.6	13.55	7.3	2.6	3.45
29	4.75	.....	10.85	5.75	2.7	3.05
30	4.45	.....	10.65	5.05	2.65	3.0
31	4.25	.....	10.95	.....	2.7	.....

NOTE.—Discharge probably not materially affected by ice during 1906.

Rating table for South Branch of Potomac River near Springfield, W. Va., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.10	163	3.30	947	4.50	2,502	6.40	5,540
2.20	210	3.40	1,039	4.60	2,440	6.60	5,970
2.30	261	3.50	1,135	4.70	2,582	6.80	6,420
2.40	315	3.60	1,235	4.80	2,728	7.00	6,890
2.50	372	3.70	1,339	4.90	2,879	7.20	7,370
2.60	432	3.80	1,447	5.00	3,035	7.40	7,870
2.70	495	3.90	1,558	5.20	3,355	7.60	8,370
2.80	561	4.00	1,672	5.40	3,690	7.80	8,870
2.90	630	4.10	1,790	5.60	4,030	8.00	9,370
3.00	702	4.20	1,912	5.80	4,380	9.00	12,000
3.10	778	4.30	2,038	6.00	4,745	10.00	15,000
3.20	860	4.40	2,168	6.20	5,130		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 8 discharge measurements made during 1903–1906. It is well defined between gage heights 2 feet and 4.5 feet. Above 10-foot gage height the discharge is approximate.

Monthly discharge of South Branch of Potomac River near Springfield, W. Va., for 1906.

[Drainage area, 1,470 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	13,500	1,240	3,320	2.26	2.61
February	1,730	315	664	.452	.47
March	25,600	432	5,080	3.45	3.98
April	14,600	1,240	4,540	3.09	3.45
May	2,800	372	1,080	.738	.85
June	1,910	315	770	.524	.58
July 1-14	819	163	449	.305	.16

NOTE.—Values for January, March, and April are good; those for February, May, June, and July are excellent.

SAVAGE RIVER AT BLOOMINGTON, MD.

This station was established May 3, 1905, and was discontinued July 15, 1906. It is located at a highway bridge about 800 feet above the junction of Savage River with North Branch of Potomac. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 63, and in Water-Supply Paper No. 192, where are given also the data for previous years.

Discharge measurements of Savage River at Bloomington, Md., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 16	Bolster and Padgett	35	68	2.95	87
April 10	R. H. Bolster	46	185	5.60	1,130
Do	do	46	175	5.40	1,027
April 11	do	46	148	4.79	685
May 28	Robert Follansbee	43	89	3.25	141

Daily gage height, in feet, of Savage River at Bloomington, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	2.8	2.75	2.53	5.32	3.22	3.35	2.
2	2.75	2.55	2.43	4.82	3.18	3.28	2.
3	3.05	2.65	2.73	4.98	3.32	2.95	2.
4	4.28	3.03	4.45	5.22	3.22	2.75	2.
5	4.52	2.75	3.83	5.88	3.0	2.75	2.
6	4.15	2.6	3.5	5.92	3.0	3.35	1.
7	3.85	2.67	3.37	4.88	2.92	4.62	1.
8	3.6	2.6	3.25	4.48	2.82	5.15	1.
9	3.3	2.53	3.17	4.42	2.82	4.05	1.
10	3.12	2.6	3.15	5.95	2.8	3.6	1.
11	3.18	2.37	2.97	4.9	2.72	3.32	1.
12	3.2	2.47	3.05	4.35	2.68	3.05	1.
13	2.75	2.5	2.87	3.95	2.58	2.88	1.
14	3.18	2.47	2.93	3.8	2.52	3.05	1.
15	3.02	2.37	3.2	4.78	2.52	2.85	1.
16	3.25	2.4	2.93	4.6	2.48	2.65	.....
17	3.52	2.47	2.88	4.3	2.38	2.55	.....
18	3.68	2.27	2.74	4.05	2.32	2.38	.....
19	4.02	2.33	2.78	3.75	2.42	2.3	.....
20	4.0	2.33	2.95	3.55	2.32	2.52	.....
21	4.15	2.47	2.9	3.52	2.3	2.98	.....
22	4.32	2.63	2.98	3.4	2.3	2.82	.....
23	7.08	2.63	2.75	3.48	2.25	2.78	.....
24	5.5	2.35	3.18	3.4	2.2	2.78	.....
25	4.55	2.47	3.05	3.52	2.2	2.62	.....
26	4.1	2.37	3.05	3.62	2.2	2.65	.....
27	3.6	2.23	4.85	3.65	2.42	2.78	.....
28	3.52	2.25	6.5	3.58	3.4	2.75	.....
29	3.48	.....	6.0	3.48	3.35	2.55	.....
30	3.2	.....	7.15	3.35	2.95	2.42	.....
31	3.18	.....	6.05	.....	2.82	.....	.....

NOTE.—No ice conditions during 1906.

Rating table for Savage River at Bloomington, Md., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.70	8	3.00	98	4.30	458	5.60	1,150
1.80	10	3.10	114	4.40	500	5.70	1,215
1.90	12	3.20	132	4.50	544	5.80	1,280
2.00	15	3.30	152	4.60	591	5.90	1,345
2.10	19	3.40	174	4.70	640	6.00	1,415
2.20	23	3.50	197	4.80	691	6.20	1,555
2.30	28	3.60	222	4.90	744	6.40	1,695
2.40	34	3.70	249	5.00	799	6.60	1,840
2.50	41	3.80	278	5.10	855	6.80	1,990
2.60	50	3.90	310	5.20	912	7.00	2,140
2.70	60	4.00	344	5.30	970		
2.80	71	4.10	380	5.40	1,030		
2.90	84	4.20	418	5.50	1,090		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 8 discharge measurements made during 1905 and 1906. It is well defined between gage heights 2.4 feet and 5.6 feet.

Monthly discharge of Savage River at Bloomington, Md., for 1905–6.

[Drainage area, 120 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
May	399	34	97.8	0.815	0.88
June	568	29	118	.983	1.10
July	466	12	85.0	.708	.82
August	210	10	34.0	.283	.33
September	535	8	56.0	.467	.52
October	509	10	82.1	.684	.79
November	418	13	51.1	.426	.48
December	924	21	220	1.83	2.11

Monthly discharge of Savage River at Bloomington, Md., for 1905–6—Continued.

Month.	Discharge second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1906.					
January	2,204	66	330	2.75	3.17
February	103	24	43.8	.365	.38
March	2,260	36	348	2.90	3.34
April	1,380	163	521	4.34	4.84
May	174	23	69.9	.582	.67
June	884	28	138	1.15	1.28
July 1-15	40	10	17.8	.148	.08

NOTE.—Values for 1905 and 1906 are excellent, except July, 1906, which is good.

GEORGES CREEK AT WESTERNPORT, MD.

This station was established May 4, 1905, and was discontinued July 15, 1906. It is located at the highway bridge in Westernport, Md., about one-half mile above the mouth of the creek. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 64, and in Water-Supply Paper No. 192, where are given also the data for previous years.

Discharge measurements of Georges Creek at Westernport, Md., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 16	Bolster and Padgett	41	27	1.49	65
March 30	Robert Follansbee	95	180	3.38	1,230
April 10	R. H. Bolster	93	98	2.50	476
May 25	Robert Follansbee	93	70	2.25	352

Daily gage height, in feet, of Georges Creek at Westernport, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	1.68	1.8	1.6	3.18	1.68	1.65	1.18
2	1.55	1.8	1.78	2.98	1.72	1.55	1.15
3	2.3	1.75	2.05	2.88	1.62	1.55	1.15
4	2.58	1.72	2.1	2.92	1.52	1.32	1.1
5	2.45	1.68	2.02	2.85	1.5	1.6	1.1
6	2.38	1.65	1.98	2.52	1.55	1.68	1.1
7	2.2	1.6	1.8	2.32	1.5	2.22	1.05
8	2.2	1.55	1.75	2.32	1.5	2.25	1.05
9	1.88	1.52	1.68	2.55	1.45	1.95	1.05
10	1.95	1.5	1.6	2.58	1.4	1.8	1.1
11	1.95	1.45	1.55	2.32	1.4	1.72	1.1
12	2.0	1.45	1.52	2.32	1.4	1.75	1.1
13	1.95	1.42	1.5	2.22	1.4	1.75	1.1
14	1.88	1.4	1.5	2.22	1.42	1.7	1.05
15	1.78	1.4	1.5	2.2	1.4	1.62	1.02
16	1.82	1.4	1.45	2.22	1.3	1.55	.....
17	2.0	1.4	1.32	2.12	1.32	1.25	.....
18	2.05	1.4	1.32	2.12	1.32	1.2	.....
19	2.12	1.4	1.38	2.22	1.25	1.2	.....
20	2.15	1.45	1.5	2.0	1.22	1.35	.....
21	2.18	1.45	1.55	2.05	1.2	1.35	.....
22	2.22	1.4	1.58	1.9	1.2	1.35	.....
23	3.28	1.35	1.55	1.88	1.15	1.38	.....
24	3.08	1.32	1.58	1.88	1.15	1.4	.....
25	2.68	1.3	1.6	1.82	1.1	1.3	.....
26	2.2	1.3	1.68	1.9	1.1	1.32	.....
27	2.12	1.38	2.62	1.85	2.02	1.38	.....
28	2.1	1.42	3.2	1.75	2.08	1.25	.....
29	2.05	.....	3.2	1.7	2.2	1.2	.....
30	1.98	.....	3.42	1.72	1.95	1.2	.....
31	1.9	.....	3.45	.....	1.88	.....	.....

NOTE.—Discharge *probably unaffected by ice.*

Rating tables for Georges Creek at Westernport, Md.

MAY 4 TO JUNE 6, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	22	1.40	38	1.60	66	1.80	112
1.30	29	1.50	50	1.70	87		

JUNE 7 TO SEPTEMBER 10, 1905.[b]

1.00	8	1.70	64	2.40	301	3.10	780
1.10	11	1.80	84	2.50	355	3.20	865
1.20	15	1.90	108	2.60	415	3.30	955
1.30	20	2.00	137	2.70	480	3.40	1,045
1.40	27	2.10	170	2.80	550	3.50	1,140
1.50	36	2.20	208	2.90	625		
1.60	48	2.30	252	3.00	700		

SEPTEMBER 11, 1905, TO JULY 15, 1906.[c]

0.90	10	1.70	115	2.50	495	3.30	1,150
1.00	15	1.80	145	2.60	560	3.40	1,250
1.10	21	1.90	180	2.70	630	3.50	1,350
1.20	29	2.00	220	2.80	705	3.60	1,455
1.30	39	2.10	265	2.90	785	3.70	1,560
1.40	52	2.20	315	3.00	870	3.80	1,670
1.50	69	2.30	370	3.10	960	3.90	1,780
1.60	90	2.40	430	3.20	1,055	4.00	1,895

[a] This table is based on one discharge measurement made during 1905 and on the form of the curve. It is not well defined.

[b] This table is based on three discharge measurements made during 1905 and on the form of the curve. It is fairly well defined between gage heights 1.5 feet and 2 feet.

[c] This table is applicable only for open-channel conditions. It is based on five discharge measurements made during 1905 and 1906. It is well defined between gage heights 1.3 feet and 3.5 feet.

Monthly discharge of Georges Creek at Westernport, Md., for 1905–6.

[Drainage area, 76 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inches.
1905.					
May 4–31	92	26	44.8	0.589	
June	154	15	45.7	.601	
July	1,090	13	127	1.67	
August	68	6	15.1	.199	
September	528	8	46.4	.611	
October	370	12	65.8	.866	
November	102	12	33.8	.445	
December	1,250	30	267	3.51	
1906.					
January	1,130	80	320	4.21	
February	145	39	71.2	.937	
March	1,300	42	260	3.42	
April	1,040	115	378	4.97	
May	315	21	83.0	1.09	
June	342	29	91.4	1.20	
July 1–14	27	16	20.8	.274	

NOTE.—Values given above are rated as follows: May, 1905, fair; August to October, 190 mate; remainder of 1905 and 1906, good.

WILLS CREEK AT CUMBERLAND, MD.

This station was established May 5, 1905, and was discontinued July 14, 1906. It is located at the highway bridge at the upper end of "The Narrows," Cumberland, Md. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 65, and in Water-Supply Paper No. 192, where are given also the data for previous years.

Discharge measurements of Wills Creek at Cumberland, Md., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 17	Bolster and Padgett	77	213	4.01	175
April 2	Robert Follansbee	115	467	6.32	1,490
April 10	R. H. Bolster	110	429	6.05	1,200
April 11	do	106	404	5.88	1,070
May 28	Robert Follansbee	69	169	3.27	55

Daily gage height, in feet, of Wills Creek at Cumberland, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	4.45	4.25	3.5	6.7	4.02	3.5	3.35
2	4.25	4.05	3.5	6.3	4.25	3.48	3.3
3	4.45	3.7	4.15	6.3	4.18	3.38	3.25
4	5.95	4.02	5.25	6.2	4.08	3.3	3.25
5	5.78	4.02	4.6	6.32	4.0	3.5	3.2
6	5.5	3.7	4.25	6.32	4.0	3.65	3.18
7	5.12	3.6	4.25	5.45	3.9	6.6	3.15
8	4.95	3.68	4.3	5.3	3.88	5.5	3.1
9	4.65	3.75	4.22	5.6	3.8	4.75	3.05
10	4.38	3.75	4.18	6.0	3.8	4.3	3.05
11	4.32	3.7	4.12	5.9	3.8	4.0	3.05
12	4.45	3.7	4.08	5.6	3.75	3.8	3.18
13	4.42	3.6	4.02	5.42	3.7	3.78	3.08
14	4.4	3.68	4.05	5.1	3.65	3.72	3.02
15	4.45	3.65	4.05	6.3	3.6	3.68	.....
16	4.7	3.6	4.1	5.92	3.55	3.6	.....
17	5.0	3.55	4.1	5.58	3.6	3.55	.....
18	4.88	3.5	4.1	5.32	3.52	3.62	.....
19	5.1	3.5	4.1	5.02	3.48	3.85	.....
20	5.02	3.5	4.18	4.88	3.45	3.9	.....
21	5.12	3.7	4.2	4.72	3.45	3.88	.....
22	5.25	3.68	4.2	4.68	3.4	3.78	.....
23	7.3	3.58	4.2	4.62	3.4	3.78	.....
24	6.95	3.55	4.2	4.52	3.35	3.7	.....
25	5.88	3.65	4.2	4.5	3.3	3.58	.....
26	5.48	3.5	4.2	4.45	3.3	3.52	.....
27	5.08	3.5	6.1	4.4	3.5	3.5	.....
28	4.9	3.5	7.7	4.32	3.9	3.55	.....
29	4.75	.....	7.2	4.22	3.65	3.5	.....
30	4.55	.....	7.05	4.12	3.55	3.38	.....
31	4.42	.....	7.9	.....	3.4	.....	.....

NOTE.—Discharge probably not affected by ice.

Rating table for Wills Creek at Cumberland, Md., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	30	3.90	164	4.80	442	6.40	1,560
3.10	38	4.00	188	4.90	482	6.60	1,785
3.20	48	4.10	214	5.00	525	6.80	2,030
3.30	60	4.20	241	5.20	620	7.00	2,295
3.40	73	4.30	270	5.40	735	7.20	2,575
3.50	88	4.40	301	5.60	860	7.40	2,870
3.60	104	4.50	334	5.80	1,005	7.60	3,170
3.70	122	4.60	368	6.00	1,170	7.80	3,480
3.80	142	4.70	404	6.20	1,355		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 9 dis measurements made during 1905 and 1906. It is well defined between gage heights 3 feet and 6.5

Monthly discharge of Wills Creek at Cumberland, Md., for 1905–6.

[Drainage area, 240 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in
1905.					
May 6–31	747	91	221	0.921	
June	1,350	104	272	1.13	
July	1,900	96	353	1.47	
August	1,040	36	174	.725	
September	647	34	128	.533	
October	595	30	149	.621	
November	570	48	115	.479	
December	2,410	63	529	2.20	
1906.					
January	2,720	256	637	2.65	
February	256	88	122	.508	
March	3,640	88	626	2.61	
April	1,900	219	806	3.36	
May	256	60	126	.525	
June	1,780	60	207	.862	
July 1–14	66	32	44.6	.186	

NOTE.—All the above values are excellent.

OPEQUON CREEK NEAR MARTINSBURG, W. VA.

This station was established May 8, 1905, and was disconti July 15, 1906. It is located at the highway bridge known as R Ford Bridge, about 4 miles southeast of Martinsburg, W. Va. conditions at this station and the bench marks are describe Water-Supply Paper No. 167, page 67, and in Water-Supply P No. 192, where are given also the data for previous years.

Discharge measurements of Opequon Creek near Martinsburg, W. Va., in 190

Date.	Hydrographer.	Width.	Area of section.	Gage height.	I ch
		Feet.	*Sq. ft.*	*Feet.*	*S*
March 18	Bolster and Padgett	75	59	1.51	
April 2	Robert Follansbee	80	213	3.32	
April 12	R. H. Bolster	78	134	2.57	
Do	do	78	132	2.56	
May 29	Robert Follansbee	75	66	1.57	

Daily gage height, in feet, of Opequon Creek near Martinsburg, W. Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	1.73	1.6	1.26	4.72	1.92	1.5	1.7
2	1.65	1.6	1.4	3.48	1.9	1.48	1.55
3	1.77	1.55	1.56	3.0	1.88	1.45	1.9
4	8.73	1.48	3.24	2.72	1.85	1.42	7.9
5	4.2	1.45	2.4	2.55	1.82	1.4	2.88
6	3.12	1.4	1.9	2.45	1.8	2.92	2.4
7	2.68	1.37	1.84	2.32	1.78	2.18	2.4
8	2.27	1.33	1.8	2.22	1.75	1.58	1.88
9	2.15	1.32	1.72	2.48	1.72	1.58	1.78
10	1.98	1.37	1.6	4.02	1.68	1.62	1.72
11	1.92	1.4	1.52	3.02	1.65	1.48	1.68
12	1.9	1.4	1.48	2.48	1.65	1.42	1.62
13	1.98	1.4	1.48	2.25	1.62	1.48	1.6
14	2.17	1.45	1.5	2.18	1.6	1.58	1.58
15	2.7	1.48	1.52	8.5	1.58	1.52	1.52
16	2.58	1.42	1.52	5.0	1.55	1.48	.....
17	2.25	1.4	1.52	3.28	1.52	5.38	.....
18	2.32	1.4	1.58	2.9	1.5	3.0	.....
19	1.98	1.4	1.72	2.62	1.5	2.75	.....
20	1.85	1.38	1.83	2.45	1.5	2.48	.....
21	1.78	1.37	1.82	2.35	1.48	5.18	.....
22	1.72	1.48	1.92	2.28	1.45	5.0	.....
23	1.75	1.42	2.28	2.22	1.45	2.58	.....
24	1.93	1.38	2.3	2.15	1.42	2.35	.....
25	1.85	1.35	2.35	2.1	1.4	2.18	.....
26	1.8	1.32	2.78	2.3	1.4	2.05	.....
27	1.75	1.3	4.0	2.25	1.42	1.88	.....
28	1.7	1.28	7.52	2.0	1.52	1.82	.....
29	1.67	.....	5.45	1.98	1.52	2.08	.....
30	1.65	.....	5.78	1.95	1.48	1.85	.....
31	1.63	.....	7.2	.....	1.4	.....	.....

NOTE.—Discharge probably not affected by ice.

Rating tables for Opequon Creek near Martinsburg, W. Va.

MAY 9 TO JUNE 4, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.15	116	1.40	152	1.70	200	2.00	257
1.20	123	1.50	167	1.80	218		
1.30	137	1.60	183	1.90	237		

OCTOBER 8 TO DECEMBER 20, 1905.[b]

1.10	50	1.50	88	1.90	140	2.30	205
1.20	58	1.60	100	2.00	155	2.40	223
1.30	67	1.70	113	2.10	171	2.50	242
1.40	77	1.80	126	2.20	188		

DECEMBER 21, 1905, TO JULY 15, 1906.[c]

1.20	97	2.60	343	4.00	897	5.80	1,825
1.30	109	2.70	371	4.10	945	6.00	1,935
1.40	122	2.80	402	4.20	993	6.20	2,045
1.50	135	2.90	436	4.30	1,042	6.40	2,155
1.60	149	3.00	472	4.40	1,092	6.60	2,265
1.70	164	3.10	510	4.50	1,142	6.80	2,375
1.80	180	3.20	549	4.60	1,193	7.00	2,485
1.90	197	3.30	589	4.70	1,244	7.20	2,595
2.00	214	3.40	630	4.80	1,295	7.40	2,705
2.10	232	3.50	672	4.90	1,347	7.60	2,815
2.20	251	3.60	715	5.00	1,399	7.80	2,925
2.30	271	3.70	759	5.20	1,504	8.00	3,035
2.40	293	3.80	804	5.40	1,610		
2.50	317	3.90	850	5.60	1,717		

[a] This curve has been drawn through one measurement and parallel to the other curves at this station.

[b] This rating curve has been drawn through one measurement and parallel to the other curves at this station.

[c] This table is applicable only for open-channel conditions. It is based on 5 discharge measurements made during 1906. Above *gage height 6 feet the rating* curve is a tangent, the difference being 55 per tenth.

Monthly discharge of Opequon Creek near Martinsburg, W. Va., for 1905–6.

[Drainage area, [illegible] square miles.]

Month.	Discharge in second-feet.			Run-o[illegible]
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
1905.				
May 6-31	253	116	144	0.524
June 1-4	140	123	131	.476
October 6-31	155	50	67.4	.245
November	90	50	61.1	.222
December	2,900	54	337	1.23
1906.				
January	3,440	153	352	1.28
February	140	107	123	.447
March	2,770	194	480	1.75
April	3,310	205	509	1.85
May	200	122	151	.549
June	1,600	122	338	1.23
July 1-15	2,980	138	387	1.41

NOTE.—Values are rated as follows: 1905, approximate; January and February, 1906, approx[illegible] March to July, 1906, good; daily discharge above 1,500 second-feet, approximate.

SHENANDOAH RIVER AT MILLVILLE, W. VA.

This station was established April 15, 1895. It is located a[illegible] one-fourth mile above the Baltimore and Ohio Railroad stati[illegible] Millville, W. Va. The highway runs within a few rods of the st[illegible] at the gaging station. The station is best reached by driving [illegible] Harpers Ferry, W. Va. The conditions at this station and the b[illegible] marks are described in Water-Supply Paper No. 167, page 71, [illegible] in Water-Supply Paper No. 192, where are given also the dat[illegible] previous years.

The following discharge measurement was made May 29, 1906:

Width, 488 feet; area, 1,720 square feet; gage height, 1.58 feet; discharge, [illegible] second-feet.

Daily gage height, in feet, of Shenandoah River at Millville, W. Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.7	2.3	1.1	4.75	2.3	1.5	2.0	1.3	3.55	1.45	2.7
2	2.45	2.2	1.1	4.2	2.2	1.5	1.8	1.4	3.8	1.45	2.5
3	2.25	2.0	1.2	3.8	2.1	1.4	1.6	1.8	2.7	1.4	2.4
4	3.4	2.4[a]	2.2	3.4	2.0	1.3	1.3	1.4	2.2	1.7	2.3
5	5.3	2.0	2.5	3.1	1.95	1.2	2.15	2.5	2.2	2.5	2.2
6	4.5	1.95	3.5	2.9	1.9	2.1	1.7	2.3	2.0	3.5	2.1
7	3.6	1.9	2.9	2.7	1.85	1.3	1.55	2.1	1.9	3.1	2.05
8	3.0	1.8	2.5	2.6	1.8	1.2	1.6	2.0	1.8	2.6	2.0
9	2.7	1.6	2.3	2.4	2.1	1.2	1.5	2.2	1.65	2.3	1.9
10	2.45	1.6	2.1	2.45	2.05	1.65	1.35	2.3	1.6	2.05	1.85
11	2.3	1.75	2.0	2.6	1.9	1.9	1.3	2.0	1.5	1.8	1.8
12	2.15	1.5	1.9	2.6	1.85	1.5	1.3	2.0	1.5	1.8	1.8
13	2.0	1.45	1.75	2.45	1.8	1.2	1.3	3.0	1.45	1.65	1.75
14	2.0	1.3	1.7	2.3	1.7	1.2	1.3	3.4	1.9	1.5	1.75
15	2.0	1.35	1.7	3.2	1.6	1.2	1.4	3.8	1.6	1.4	1.75
16	2.2	1.3	1.8	4.7	1.55	2.0	1.3	3.9	1.5	1.4	1.7
17	2.3	1.3	1.9	4.2	1.4	2.6	1.3	3.2	1.35	1.4	1.65
18	2.25	1.2	2.6	3.6	1.35	2.1	1.3	4.1	1.3	1.5	1.6
19	2.2	1.2	2.7	3.2	1.45	3.8	1.4	3.35	1.35	4.1	1.8
20	2.1	1.2	2.7	2.95	1.4	2.4	1.5	4.2	1.3	11.3	2.25

[a] Backwater from ice, February 4.

Gage height, in feet, of Shenandoah River at Millville, W. Va., for 1906—Continued.

Day	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
2	0	1.2	2.7	2.7	1.3	2.7	1.4	3.9	1.25	12.8	4.3	3.5
1	9	1.2	2.9	2.5	1.25	4.8	1.3	3.4	1.2	8.3	3.8	3.6
1	8	1.2	3.15	2.4	1.2	3.7	1.2	3.3	1.2	6.5	3.85	3.4
1	8	1.2	3.1	2.25	1.2	2.9	2.0	4.0	1.2	5.7	2.9	3.0
3	8	1.15	2.9	2.1	1.15	2.5	1.6	4.5	1.1	4.9	2.7	2.6
3	2	1.1	2.9	2.0	1.1	2.15	1.5	4.5	1.25	4.2	2.7	2.2
2	7	1.1	3.0	2.0	1.2	2.4	1.4	3.8	1.25	3.8	2.25	2.0
2	5	1.1	4.8	3.4	1.3	3.5	1.4	5.4	1.25	3.5	2.15	2.4
2	4	.....	4.9	2.9	1.5	3.25	1.4	4.7	1.25	3.2	2.1	2.4
2	4	.....	4.6	2.5	1.4	2.4	1.5	5.0	1.35	3.0	2.0	2.25
2	5	.....	4.6	.....	1.4	.....	1.3	4.2	.....	2.8	.....	2.2

Rating table for Shenandoah River at Millville, W. Va., for 1905-6.

Feet.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
	Sec.-ft.	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.10	1,090	2.40	3,130	3.70	6,100	6.00	14,240
1.20	1,200	2.50	3,330	3.80	6,380	6.20	15,120
1.30	1,320	2.60	3,530	3.90	6,670	6.40	16,000
1.40	1,450	2.70	3,730	4.00	6,960	6.60	16,920
1.50	1,580	2.80	3,940	4.20	7,560	6.80	17,840
1.60	1,720	2.90	4,150	4.40	8,200	7.00	18,800
1.70	1,870	3.00	4,370	4.60	8,860	8.00	24,020
1.80	2,030	3.10	4,600	4.80	9,540	9.00	30,400
1.90	2,200	3.20	4,840	5.00	10,260	10.00	37,500
2.00	2,380	3.30	5,080	5.20	11,020	11.00	45,100
2.10	2,560	3.40	5,320	5.40	11,780	12.00	53,500
2.20	2,750	3.50	5,570	5.60	12,580	13.00	62,700
2.30	2,940	3.60	5,830	5.80	13,400		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 15 discharge measurements made during 1895 and 1904-1906. It is well defined between gage heights 0.4 foot and 5 feet. Values above 5 feet are based on a discharge curve, which is the product of a well-defined area curve and a fairly accurate extension of the velocity curve.

Monthly discharge of Shenandoah River at Millville, W. Va., for 1906.

[Drainage area, 3,000 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary	11,400	2,030	3,720	1.24	1.43
ruary	2,940	1,090	1,640	.548	.57
ch	9,900	1,090	3,890	1.30	1.50
l	9,370	2,380	4,460	1.49	1.66
	2,940	1,090	1,800	.601	.69
	9,540	1,200	2,900	.965	1.08
	2,660	1,200	1,580	.527	.61
ust	11,800	1,320	5,220	1.74	2.01
mber	6,380	1,090	1,980	.660	.74
ber	60,800	1,450	8,250	2.75	3.17
mber	7,880	1,720	3,020	1.01	1.13
mber	8,520	1,450	3,050	1.02	1.18
The year	60,800	1,090	3,460	1.15	15.77

RE.—The discharge for February 4 was corrected for backwater. Values are rated as follows: 1906, ent; discharge above 25,000 second-feet, fair.

The following table gives the horsepower (80 per cent efficiency per foot of fall that may be developed at different rates of discharge and shows the number of days on which the flow and the corresponding horsepower were respectively less than the amounts given in the columns for "discharge" and "horsepower:"

Discharge and horsepower table for Shenandoah River at Millville, W. Va., from 1895 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.											
		1895.[a]	1896.	1897.	1898.	1899.[b]	1900.	1901.	1902.	1903.	1904.	1905.	1906.
485	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	15	.....	.....
550	50	33	4	.....	.....	.....	.....	.....	.....	.....	73	9	.....
660	60	98	24	50	.....	3	20	.....	5	1	106	60	.....
770	70	118	26	67	.....	29	54	1	26	8	114	73	.....
880	80	125	34	85	7	70	89	11	63	19	122	101	.....
990	90	154	75	107	11	112	109	38	97	37	133	137	.....
1,100	100	160	82	146	32	141	128	55	112	59	147	155	7
1,320	120	166	89	179	91	167	161	78	145	82	180	180	36
1,540	140	185	130	210	116	184	202	104	167	118	215	208	85
1,760	160	192	192	220	143	194	219	120	174	129	234	238	116

[a] April 15 to December 31.
[b] Missing days estimated from Point of Rocks records.

NOTE.—From April 15, 1895, to December 31, 1906, the minimum flow was 480 second-feet, giving 4 horsepower per foot of fall on 5 consecutive days in October, 1895, and on 15 days (5 consecutive) in October and November, 1904.

SOUTH FORK OF SHENANDOAH RIVER NEAR FRONT ROYAL, VA.

This station was established June 26, 1899, and was discontinued July 16, 1906. It is located about 1 mile above the bridge, which is near the Norfolk and Western Railway station. The conditions at this station and the bench marks are described in Water Supply Paper No. 167, page 74, and in Water Supply Paper No. 192, where are given also the data for previous years.

The following discharge measurement was made June 16, 1906:

Width, 300 feet; area, 906 square feet; gage height, 4.70 feet; discharge, 1,070 second feet.

Daily gage height, in feet, of South Fork of Shenandoah River near Front Royal, Va. for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	5.65	5.43	4.2	7.05	5.22	4.7	5.4
2	5.45	5.3	4.17	6.8	5.1	4.62	5.2
3	5.25	5.2	4.23	6.45	5.0	4.5	5.2
4	6.13	5.1	5.05	6.25	4.95	4.42	5.2
5	8.47	4.85	7.02	5.85	4.9	4.38	4.9
6	7.22	4.82	6.33	5.68	4.85	4.3	4.4
7	6.4	4.9	5.8	5.52	4.88	4.22	4.6
8	6.0	4.73	5.47	5.4	5.0	4.2	4.6
9	5.65	4.65	5.15	5.32	5.1	4.18	4.4
10	5.38	4.5	5.15	5.3	5.05	4.1	4.2
11	5.17	4.52	5.05	5.4	5.0	4.1	4.3
12	5.0	4.45	4.9	5.35	4.9	4.15	4.3
13	5.0	4.4	4.83	5.28	4.8	4.22	5.2
14	5.0	4.4	4.7	5.2	4.78	4.2	4.6
15	5.05	4.43	4.8	6.35	4.6	4.4	4.1

Daily gage height, in feet, of South Fork of Shenandoah River near Front Royal, Va for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July
16	5.3	4.32	5.25	7.75	4.62	4.65	4.
17	5.3	4.4	5.95	6.8	4.52	5.45	.....
18	5.3	4.33	5.77	6.38	4.55	5.75	.....
19	5.2	4.3	5.8	6.08	4.45	5.35	.....
20	5.12	4.3	5.75	5.8	4.4	5.35	.....
21	5.0	4.3	5.8	5.55	4.35	6.2	.....
22	4.9	4.25	6.1	5.45	4.3	6.9	.....
23	4.93	4.22	5.9	5.35	4.28	6.05	.....
24	6.8	4.28	5.8	5.25	4.2	5.5	.....
25	6.85	4.25	5.6	5.05	4.2	5.35	.....
26	6.22	4.25	5.58	5.1	4.2	5.28	.....
27	5.75	4.12	5.77	5.35	4.22	5.72	.....
28	5.63	4.25	6.75	5.45	4.3	6.15	.....
29	5.6	.....	7.35	5.4	4.65	5.5	.....
30	5.55	.....	7.1	5.3	4.4	5.35	.....
31	5.55	.....	6.9	.....	4.72	.....	.....

NOTE.—Discharge probably unaffected by ice.

Rating table for South Fork of Shenandoah River near Front Royal, Va., for 1904–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.10	610	5.10	1,460	6.10	2,790	7.20	4,680
4.20	670	5.20	1,570	6.20	2,940	7.40	5,080
4.30	740	5.30	1,690	6.30	3,100	7.60	5,480
4.40	810	5.40	1,810	6.40	3,260	7.80	5,900
4.50	890	5.50	1,940	6.50	3,430	8.00	6,320
4.60	970	5.60	2,070	6.60	3,600	8.20	6,760
4.70	1,060	5.70	2,210	6.70	3,770	8.40	7,200
4.80	1,150	5.80	2,350	6.80	3,940		
4.90	1,250	5.90	2,490	6.90	4,120		
5.00	1,350	6.00	2,640	7.00	4,300		

NOTE.—The above table is applicable only for open-channel conditions. It is based on nine dischar measurements made during 1904–1906. It is well defined between gage heights 3.4 feet and 5.3 feet.

Monthly discharge of South Fork of Shenandoah River near Front Royal, Va., for 190

[Drainage area, 1,570 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth i inches
nuary	7,350	1,250	2,280	1.45	1.
bruary	1,850	622	957	.610	.
rch	4,980	652	2,230	1.42	1.
ril	5,800	1,400	2,390	1.52	1.
y	1,590	670	1,050	.668	.
e	4,120	610	1,460	.932	1.
y 1–16	1,880	705	1,140	.725	.

OTE.—Values for 1906 are excellent.

SOUTH RIVER AT BASIC CITY, VA.

This station was established June 29, 1905, in connection with th vestigation of stream pollution in the Shenandoah Valley, and wa continued July 15, 1906. It is located at the highway bridg e-half mile below the Chesapeake and Ohio Railway bridge

Basic City, Va. The conditions at this station and the bench m are described in Water-Supply Paper No. 167, page 76, and in W Supply Paper No. 192, where are given also references to pub tions that contain data for previous years.

Discharge measurements of South River at Basic City, Va., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	I ch
		Feet.	*Sq. ft.*	*Feet.*	*S*
April 11	Robert Follansbee	72	206	3.25	
June 14	Follansbee and Padgett	70	158	2.69	

Daily gage height, in feet, of South River at Basic City, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.0	3.4	2.8	3.6	2.9	2.75
2	2.9	3.3	2.8	3.6	2.9	2.7
3	3.2	3.2	5.3	3.5	2.8	2.6
4	4.4	3.2	4.9	3.4	2.9	2.6
5	3.7	3.2	4.0	3.2	2.9	2.5
6	3.4	3.1	3.8	3.3	2.8	2.4
7	3.2	3.1	3.5	3.2	3.0	2.6
8	3.0	3.0	3.5	3.1	3.0	2.6
9	2.9	2.9	3.3	3.1	2.8	2.5
10	2.8	2.9	3.0	3.2	2.85	2.5
11	2.7	2.9	3.1	3.25	2.85	2.4
12	2.8	2.9	3.1	3.2	2.7	2.5
13	3.1	2.9	3.1	3.15	2.8	2.6
14	3.1	2.9	3.0	3.1	2.8	2.7
15	3.1	2.9	3.1	4.5	2.7	2.6
16	3.0	2.8	3.2	4.1	2.75	2.6
17	3.0	2.7	3.3	3.75	2.8	3.2
18	3.1	2.7	3.3	3.55	2.65	2.5
19	3.2	2.7	3.3	3.4	2.7	2.8
20	3.2	2.7	3.2	3.25	2.7	5.45
21	3.1	2.7	3.3	3.25	2.6	4.9
22	3.1	2.8	3.2	3.2	2.6	3.45
23	4.9	2.8	3.2	3.2	2.6	3.2
24	4.4	2.8	3.2	3.1	2.5	3.0
25	3.9	2.8	3.1	3.0	2.6	2.9
26	3.6	2.8	3.2	3.1	2.6	3.2
27	3.6	2.8	3.5	3.05	2.65	2.95
28	3.7	2.8	3.7	3.0	2.75	2.85
29	3.7	.....	3.7	3.0	3.0	2.8
30	3.6	.....	3.5	2.9	2.7	2.7
31	3.5	.....	3.8	.....	2.75	.....

NOTE.—Discharge probably unaffected by ice.

Rating table for South River at Basic City, Va., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	7	2.90	135	3.80	377	4.70	678
2.10	12	3.00	159	3.90	407	4.80	714
2.20	19	3.10	183	4.00	438	4.90	750
2.30	29	3.20	208	4.10	470	5.00	786
2.40	41	3.30	234	4.20	503	5.10	823
2.50	55	3.40	261	4.30	537	5.20	860
2.60	72	3.50	289	4.40	572	5.30	897
2.70	91	3.60	318	4.50	607	5.40	934
2.80	112	3.70	347	4.60	642	5.50	972

NOTE.—The above table is applicable only for open-channel conditions. It is based on 6 dis *measurements* made during 1905 and 1906. It is fairly well defined between gage heights 2.5 f *4.1 feet.*

Monthly discharge of South River at Basic City, Va., for 1905-6.

[Drainage area, 142 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
July	786	41	159	1.12	1.29
August	135	29	70.9	.499	.58
September	208	19	58.2	.410	.46
October	91	12	42.2	.297	.34
November	41	7	23.4	.165	.18
December	972	19	160	1.13	1.30
1906.					
January	750	91	258	1.82	2.10
February	261	91	141	.993	1.03
March	897	112	276	1.94	2.24
April	607	135	241	1.70	1.90
May	159	55	106	.746	.86
June	953	41	154	1.08	1.20
July 1-15	91	29	62.5	.440	.24

NOTE. Values are rated as follows: July, August, and December, 1905, and all of 1906, excellent; September, 1905, good; October, 1905, fair; November, 1905, approximate; discharge below 25 second-feet, approximate.

LEWIS CREEK NEAR STAUNTON, VA.

This station was established June 30, 1905, in connection with the investigation of stream pollution in the Shenandoah Valley, and was discontinued July 15, 1906. It is located at the private bridge across Lewis Creek, on the property of William Glenn, 2 miles from Staunton. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 77, and in Water-Supply Paper No. 192, where are given also references to publications that contain data for previous years.

Discharge measurements of Lewis Creek near Staunton, Va., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 10	Robert Follansbee	16	13.9	0.83	12.5
June 14	Follansbee & Padgett	15	9.7	.55	6.6

Daily gage height, in feet, of Lewis Creek near Staunton, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	0.54	0.49	0.74	0.74	0.48	0.54	0.64
2	.43	.53	.70	.70	.53	.53	.53
3	.54	.60	.71	.64	.60	.54	.54
4	1.43	.53	.53	.49	.49	.58	.53
5	.94	.54	.64	.54	.53	.59	.49
6	.83	.53	.59	.48	.54	.48	.53
7	.64	.49	.54	.44	.53	.54	.64
8	.53	.53	.53	.57	.54	.53	.53
9	.49	.44	.71	.44	.43	.49	.54
10	.43	.48	.53	.83	.49	.53	.48
11	.59	.44	.54	.84	.48	.44	.44
12	.48	.53	.59	.73	.49	.53	.48
13	.69	.49	.74	.79	.43	.54	.53
14	.53	.59	.63	.63	.44	.53	.64
15	.59	.54	1.04	.74	.48	.49	.43

Daily gage height, in feet, of Lewis Creek near Staunton, Va., for 1906—Continu

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
16	0.53	0.48	0.83	0.63	0.49	0.63
17	.44	.54	.84	.74	.33	.49
18	.48	.53	.83	.53	.34	.43
19	.59	.49	.84	.49	.48	.49
20	.53	.43	.78	.53	.44	.53
21	.74	.49	.74	.49	.43	.49
22	.63	.53	.70	.53	.49	.43
23	.74	.54	.64	.64	.38	.44
24	.63	.43	.63	.63	.34	.93
25	.54	.54	.64	.54	.33	1.94
26	.48	.53	.59	.54	.94	1.83
27	.54	.49	.54	.59	1.18	.94
28	.63	.43	1.13	.49	1.64	.73
29	.54	.....	.84	.63	1.13	.54
30	.48	.....	.93	.64	.64	.53
31	.44	.....	1.24	.....	.58	.....

NOTE.—Discharge probably unaffected by ice.

Rating tables for Lewis Creek near Staunton, Va.

JULY 1, 1905, TO MAY 27, 1906.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.30	1.0	0.60	5.5	0.90	14.9	1.20	29.0
.35	1.4	.65	6.8	.95	16.8	1.25	32.0
.40	1.9	.70	8.2	1.00	18.9	1.30	35.5
.45	2.6	.75	9.7	1.05	21.0	1.35	39.0
.50	3.4	.80	11.3	1.10	23.5	1.40	42.5
.55	4.4	.85	13.0	1.15	26.0	1.45	46.5

MAY 28 TO JULY 15, 1906.[b]

0.25	1.3	0.60	7.9	0.95	20.5	1.60	63
.30	1.8	.65	9.4	1.00	23.0	1.70	71
.35	2.5	.70	11.0	1.10	28.5	1.80	79
.40	3.3	.75	12.7	1.20	34.5	1.90	88
.45	4.2	.80	14.5	1.30	41	2.00	97
.50	5.3	.85	16.3	1.40	48		
.55	6.5	.90	18.3	1.50	55		

[a] This table is applicable only for open-channel conditions. It is based on 3 discharge measure made during 1905 and 1906. It is fairly well defined between gage heights 0.5 foot and 0.8 foot.

[b] This table is based on 1 discharge measurement made during 1906 and on the form of the pre curve.

Monthly discharge of Lewis Creek near Staunton, Va., for 1905–6.

[Drainage area, 20 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in
1905.					
July	24.	1.9	6.0	0.299	
August	5.5	1.4	3.2	.158	
September	5.5	1.9	2.8	.138	
October	19.	1.4	4.6	.229	
November	9.7	1.4	3.5	.173	
December	6.8	1.9	3.3	.167	
1906.					
January	45.	2.3	6.6	.329	
February	5.5	2.3	3.6	.180	
March	31.	4.0	9.7	.485	
April	13.	2.3	6.1	.303	
May	66.	1.2	7.4	.370	
June	92.	3.8	12.3	.615	
July 1-15	9.1	3.8	6.2	.308	

NOTE.—Values are rated as follows: July and October, 1905, and January, March, April, and 1906, good; remainder of the period fair, except June, which is approximate; discharge below 2 s feet and above 30 second-feet, approximate.

COOKS CREEK NEAR MOUNT CRAWFORD, VA.

s station was established July 1, 1905, in connection with the igation of stream pollution in the Shenandoah Valley, and was tinued July 15, 1906. It is located at the upper highway across Cooks Creek, three-fourths of a mile from Mount Craw- 'a. The conditions at this station and the bench marks are ed in Water-Supply Paper No. 167, page 78, and in Water- Paper No. 192, where are given also the data for previous

following measurement was made April 10, 1906:

31 feet; area, 78 square feet; gage height, 2.32 feet; discharge, 32.4 second-

ly gage height, in feet, of Cooks Creek at Mount Crawford, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
	2.05	2.0	2.0	2.5	2.1	2.0	2.1
	2.05	2.0	2.0	2.4	2.1	2.0	2.1
	2.05	1.8	2.0	2.3	2.1	2.0	2.1
	3.0	2.0	2.4	2.3	2.1	2.0	2.1
	2.5	2.0	2.2	2.2	2.1	2.0	2.0
	2.3	2.1	2.1	2.3	2.1	1.9	2.0
	2.3	2.0	2.1	2.2	2.2	1.9	2.0
	2.2	2.0	2.1	2.2	2.2	1.9	2.0
	2.2	2.0	2.1	2.3	2.1	1.9	2.0
	2.1	2.0	2.1	2.3	2.1	1.9	2.0
	2.1	2.1	2.1	2.2	2.1	1.9	3.0
	2.1	2.0	2.1	2.2	2.0	1.9	2.1
	2.1	2.0	2.05	2.2	2.1	1.8	2.0
	2.3	2.0	2.4	2.2	2.1	1.8	2.0
	2.3	2.0	2.6	2.5	2.0	1.8	2.0
	2.2	1.9	2.5	2.4	2.0	1.8	.....
	2.2	2.0	2.4	2.3	2.0	2.0	.....
	2.2	2.0	2.3	2.2	2.0	2.0	.....
	2.1	1.9	2.4	2.2	2.0	2.0	.....
	2.1	1.9	2.3	2.2	2.0	2.5	.....
	2.1	2.0	2.3	2.2	1.9	2.1	.....
	2.1	2.0	2.3	2.2	1.9	2.2	.....
	2.3	2.0	2.3	2.2	1.9	2.1	.....
	2.3	1.8	2.3	2.1	2.0	2.0	.....
	2.2	2.0	2.3	2.1	2.0	2.0	.....
	2.1	2.0	2.3	2.2	2.0	2.1	.....
	2.1	2.0	2.6	2.2	2.0	3.0	.....
	2.2	2.0	2.5	2.1	2.0	2.0	.....
	2.2	.....	2.5	2.1	2.0	2.2	.....
	2.1	.....	2.4	2.1	2.0	2.1	.....
	2.1	.....	2.5	.....	2.0	.....	.....

Discharge probably unaffected by ice.

onthly discharge of Cooks Creek near Mount Crawford, Va., for 1905-6.

[Drainage area, 41 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
	346	19	43.8	1.07	1.23
	27	13	19.7	.480	.55
	16	10	12.7	.310	.35
	19	10	11.4	.278	.32
	13	10	11.4	.278	.31
	64	10	18.7	.456	.53

Monthly discharge of Cooks Creek near Mount Crawford, Va., for 1905–6—Continued.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1906.					
January	71	21	27.5	.671	.77
February	23	13	18.5	.451	.47
March	46	19	30.6	.746	.86
April	41	23	28.7	.700	.78
May	27	16	20.6	.502	.58
June	71	13	21.0	.512	.57
July 1-15	71	19	23.8	.580	.32

NOTE.—Values rated as follows: July, 1905, fair; August and December, 1905, good; September to November, 1905, approximate; 1906, good. Discharge determinations below 15 second-feet and above 60 second-feet, approximate. The rating used to determine the above values is virtually based on two measurements and hence is very uncertain.

ELK RUN AT ELKTON, VA.

This station was established June 28, 1905, in connection with the investigation of stream pollution in the Shenandoah Valley and was discontinued July 15, 1906. It was located at the highway bridge 500 feet south of the railroad station at Elkton, Va. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 80, and in Water-Supply Paper No. 192, where are given also the data for previous years.

Discharge measurements of Elk Run at Elkton, Va., in 1906.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
April 11	Robert Follansbee	2.78	15.7
June 14	Follansbee and Padgett	2.57	6.5

Daily gage height, in feet, of Elk Run at Elkton, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	2.85	2.9	2.7	3.1	2.9	2.67	2.5
2	2.8	2.95	2.7	3.8	2.88	2.5	2.5
3	2.75	2.9	3.35	3.0	2.75	2.6	2.5
4	3.25	2.9	3.3	2.95	2.8	2.65	2.6
5	3.1	2.9	2.9	2.85	2.8	2.51	2.5
6	3.0	2.85	2.85	2.9	2.9	2.6	3.5
7	2.91	2.85	2.8	2.85	2.95	2.59	2.8
8	2.8	2.8	2.8	2.8	2.9	2.5	2.75
9	2.96	2.8	2.81	2.95	2.8	2.6	2.7
10	2.91	2.8	2.7	2.8	2.87	2.58	2.75
11	2.9	2.8	2.8	2.85	2.85	2.53	2.7
12	2.8	2.78	2.75	2.8	2.7	2.6	2.75
13	2.8	2.77	2.85	2.8	2.75	2.58	2.7
14	2.8	2.75	2.95	2.85	2.7	2.47	2.7
15	3.0	2.7	3.0	4.5	2.55	2.58	2.75
16	2.9	2.77	3.1	3.5	2.64	2.6	.....
17	2.85	2.7	3.0	3.2	2.6	2.6	.....
18	2.8	2.7	2.95	3.0	2.6	2.65	.....
19	2.8	2.8	2.9	2.95	2.6	2.7	.....
20	2.75	2.72	2.85	2.85	2.6	3.65	.....

Daily gage height, in feet, of Elk Run at Elkton, Va., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
21	2.75	2.7	2.9	2.9	2.55	2.9	.....
22	2.8	2.78	2.9	2.9	2.62	3.2	.....
23	3.0	2.77	2.85	2.85	2.6	2.9	.....
24	3.1	2.8	2.8	2.8	2.5	2.87	.....
25	3.0	2.75	2.7	2.8	2.6	2.82	.....
26	2.95	2.78	2.9	2.95	2.62	2.72	.....
27	3.0	2.75	2.85	3.0	2.5	2.63	.....
28	3.15	2.75	2.9	2.95	2.72	2.6	.....
29	2.95	.....	3.0	2.95	2.7	2.6	.....
30	3.0	.....	2.9	2.85	2.65	2.55	.....
31	2.9	.....	3.1	.....	2.7	.....	.....

NOTE.—Discharge affected only slightly by ice.

Daily discharge, in second-feet, of Elk Run at Elkton, Va., for 1905–6.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1905.							1905.						
1	14	8.5	8.5	6.5	9.5	9.5	17	9.5	10.5	5.5	10	9.5	7.5
2	14	8	7	6.5	9.5	9.5	18	9.5	8.5	5.5	9	9.5	7.5
3	11	8	7	6.5	9.5	9.5	19	8.5	9.5	5.5	9	9.5	9.5
4	11	7	7	6	9.5	9.5	20	8	8.5	15	9	10.5	32
5	11	7	8.5	6	9.5	9.5	21	8	8.5	8.5	10	9.5	46
6	11	7	7	6.5	9.5	9.5	22	10.5	9.5	7	10	8.5	11.5
7	11	7	5.5	6.5	9.5	9.5	23	7	8.5	7	10	8.5	9.5
8	11	9.5	5.5	6.5	12	8.5	24	7	23	7	10	8.5	9.5
9	9	8.5	5.5	8	9.5	8.5	25	7	28	6.5	12	8.5	11.5
10	9	7	5.5	8	9.5	9.5	26	7	19	6.5	12	8.5	9.5
11	9	10.5	6	27	9.5	9.5	27	7	19	6.5	9	8.5	11.5
12	57	10.5	5.5	14.5	9.5	8.5	28	8.5	12.5	6.5	9.5	8.5	11.5
13	28	29	6	10	9.5	8.5	29	8.5	10	6.5	9.5	8.5	17
14	19	85	6	8	12	8.5	30	8.5	10	6.5	9.5	8.5	15.5
15	12.5	19.5	6	8	9.5	7.5	31	8.5	8.5	.....	9.5	.....	14
16	9.5	13	5.5	8	9.5	7.5							

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1906.							
1	13	15.5	11.5	29	17.5	9	6
2	11.5	18	11.5	89	17	6.5	6
3	10.5	16.5	42.5	24	13	8	6
4	29	16.5	38.5	21.5	14.5	8	7
5	21.5	16.5	17.5	17.5	14.5	6	6
6	17.5	15	15.5	19.5	17.5	7	44
7	14.5	15	14	17.5	19.5	7	11
8	11.5	13.5	15	16	16.5	6	11
9	16	13.5	15	21.5	13.5	7	9
10	14.5	13.5	12	16	15.5	7	9
11	14	13.5	15	17.5	15	6	9
12	11.5	13	13.5	16	13	7	9
13	11.5	12.5	16.5	16	12	7	9
14	11.5	12	20.5	17.5	13	5.5	9
15	17.5	11	22.5	132	8	6.5	10
16	15.5	12.5	27.5	58.5	9.5	7	.....
17	14	11	22.5	35.5	8.5	7	.....
18	12.5	11	20.5	24	8.5	7.5	.....
19	12.5	14	18.5	21.5	8.5	8.5	.....
20	11	12	16.5	16.5	8.5	54	.....
21	11	11.5	18.5	18.5	7.5	13	.....
22	12.5	13.5	18.5	18.5	9	24	.....
23	19	13	16.5	16.5	8.5	13	.....
24	23	14	15	15	7	12	.....
25	19	12.5	13	15	8.5	11	.....
26	17	13.5	19.5	20.5	8	9	.....
27	19	12.5	17.5	23	6.5	7.5	.....
28	25.5	12.5	19.5	20.5	10	7	.....
29	17	.....	24	19.5	9.5	7	.....
30	19	.....	19.5	16	8	6.5	.....
31	15.5	.....	29	.....	9.5	.....	.....

NOTE.—Discharge obtained by indirect method for shifting channel.

Monthly discharge of Elk Run at Elkton, Va., for 1905–6.

[Drainage area, 15.8 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
July	57	7.0	11.9	0.753	0.87
August	85	7.0	14.1	.892	1.03
September	15	5.5	6.7	.426	.48
October	27	6.0	9.4	.594	.68
November	12	8.5	9.4	.595	.66
December	46	7.5	11.8	.747	.86
1906.					
January	29	10	15.8	1.00	1.15
February	18	11	13.5	.854	.89
March	42	11	19.3	1.22	1.41
April	132	15	27.0	1.71	1.91
May	20	6.5	11.5	.728	.84
June	54	5.5	9.9	.627	.70
July 1–15	44	6.0	10.7	.677	.38

NOTE.—Values for 1905 and 1906 are approximate, owing to shifting channel and insufficient discharge measurements.

HAWKSBILL CREEK NEAR LURAY, VA.

This station was established June 27, 1905, in connection with the investigation of stream pollution in the Shenandoah River Valley, and was discontinued July 15, 1906. It is located a short distance above the mouth of Dry Run, 1½ miles north of Luray, Va. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 81, and in Water-Supply Paper No. 192, where are given also references to publications that contain data for previous years.

Discharge measurements of Hawksbill Creek near Luray, Va., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 12	Robert Follansbee	39	46	1.86	75
June 15 [a]	Follansbee and Padgett	20	17	1.50	36

[a] Wading below foot bridge.

Daily gage height, in feet, of Hawksbill Creek near Luray, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	2.0	1.9	1.55	2.3	1.9	1.6	1.6
2	1.9	1.9	1.55	2.2	1.85	1.6	1.55
3	3.3	1.9	1.8	2.1	1.85	1.55	1.55
4	2.7	1.85	2.0	2.05	1.85	1.55	1.55
5	2.45	1.85	1.95	2.0	1.8	1.5	1.55
6	2.25	1.75	1.85	1.95	1.75	1.5	1.5
7	2.2	1.7	1.85	1.95	1.75	1.5	1.5
8	2.1	1.7	1.85	1.9	1.75	1.5	1.5
9	2.0	1.7	1.8	1.9	1.75	1.5	1.5
10	2.05	1.65	1.8	1.95	1.75	2.0	1.5
11	2.0	1.65	1.75	1.9	1.75	1.8	1.8
12	1.9	1.65	1.7	1.9	1.7	1.6	1.6
13	1.8	1.65	1.7	1.8	1.7	1.55	1.55
14	1.8	1.7	1.7	1.8	1.65	1.55	1.55
15	1.8	1.65	1.75	3.35	1.65	2.65	1.55

Daily gage height, in feet, of Hawksbill Creek near Luray, Va., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
16	1.8	1.6	1.8	3.05	1.65	1.95	.....
17	1.75	1.6	1.75	2.55	1.65	2.5	.....
18	1.75	1.6	1.75	2.35	1.6	1.8	.....
19	1.75	1.55	1.85	2.25	1.6	1.6	.....
20	1.75	1.55	1.9	2.2	1.6	1.6	.....
21	1.7	1.6	1.9	2.1	1.6	2.45	.....
22	1.65	1.55	1.9	2.0	1.55	1.75	.....
23	1.75	1.55	1.9	1.85	1.5	1.7	.....
24	1.75	1.5	1.9	1.85	1.5	1.7	.....
25	1.8	1.55	1.9	1.85	1.5	1.7	.....
26	1.8	1.55	1.9	2.1	1.5	1.8	.....
27	1.9	1.55	2.15	2.05	1.5	1.8	.....
28	1.9	1.55	2.4	2.0	1.6	1.75	.....
29	1.9	.....	2.35	1.9	1.6	1.7	.....
30	1.9	.....	2.3	1.9	1.55	1.65	.....
31	1.9	.....	2.4	.....	1.5	.....	.....

NOTE.—Discharge probably unaffected by ice.

Rating table for Hawksbill Creek near Luray, Va., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.30	24	1.90	83	2.50	196	3.10	355
1.40	30	2.00	98	2.60	220	3.20	384
1.50	37	2.10	115	2.70	245	3.30	414
1.60	46	2.20	133	2.80	271	3.40	445
1.70	57	2.30	152	2.90	298		
1.80	69	2.40	173	3.00	326		

NOTE.—The above table is applicable only for open-channel conditions. It is based on five discharge measurements made during 1905 and 1906. It is fairly well defined between gage heights 1.4 feet and 2 feet.

Monthly discharge of Hawksbill Creek near Luray, Va., for 1905–6.

[Drainage area, 52 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
June 27-31	63	46	54.5	1.05	0.16
July	46	30	36.1	.694	.80
August	63	27	32.6	.627	.72
September	37	24	27.5	.529	.59
October	46	27	30.0	.577	.66
November	34	27	30.0	.577	.64
December	298	30	81.7	1.57	1.81
1906.					
January	414	52	100	1.92	2.21
February	83	37	53.9	1.04	1.08
March	173	42	85.2	1.64	1.89
April	430	69	123	2.37	2.64
May	83	37	53.6	1.03	1.19
June	232	37	68.8	1.32	1.47
July 1-15	69	37	42.7	.821	.458

NOTE.—Values rated as follows: June to August, 1905, February, March, May to July, 1906, excellent; remainder of 1905 and 1906, good.

NORTH FORK OF SHENANDOAH RIVER NEAR RIVERTON, VA.

This station was established June 26, 1899, and was discontinued July 14, 1906. It is located about 2 miles above Riverton, Va., on the farm owned by L. W. Burke. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 83, and in Water-Supply Paper No. 192, where are given also the data for previous years.

The following discharge measurement was made April 13, 1906:

Width, 230 feet; area, 638 square feet; gage height, 5.60 feet; discharge, 969 second-feet.

Daily gage height, in feet, of North Fork of Shenandoah River near Riverton, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	5.7	5.3	4.55	7.9	5.65	4.62	5.05
2	5.45	5.2	4.5	7.1	5.5	4.7	4.88
3	5.4	5.1	4.75	6.7	5.4	4.58	4.85
4	8.6	5.5	6.45	6.32	5.35	4.52	6.12
5	7.75	5.0	6.55	6.1	5.25	4.65	5.82
6	6.83	4.98	5.9	5.92	5.32	4.62	5.2
7	6.2	5.15	5.55	5.75	5.32	4.55	4.95
8	5.85	5.6	5.45	5.6	5.48	4.75	4.82
9	5.58	5.5	5.35	5.52	5.45	4.62	4.7
10	5.35	5.25	5.25	6.1	5.3	4.6	4.6
11	5.37	5.45	5.15	5.95	5.22	4.85	4.6
12	5.27	4.9	5.0	5.75	5.2	4.78	4.6
13	5.25	4.68	5.0	5.62	5.05	4.65	4.65
14	5.3	4.6	5.0	5.28	5.0	4.58	4.62
15	5.4	4.68	5.05	6.4	4.9	5.05	.....
16	5.48	4.65	5.2	6.98	4.88	5.25	.....
17	5.4	4.8	5.45	6.4	4.82	5.5	.....
18	5.38	4.55	5.58	6.05	4.8	5.85	.....
19	5.33	4.52	5.8	5.88	4.8	5.9	.....
20	5.27	4.6	5.9	5.7	4.72	5.65	.....
21	5.2	4.6	5.95	5.58	4.62	6.85	.....
22	5.1	4.6	6.2	5.48	4.6	7.25	.....
23	5.05	4.6	6.55	5.4	4.6	6.6	.....
24	5.7	4.6	6.45	5.28	4.55	5.8	.....
25	5.9	4.53	6.2	5.2	4.55	5.55	.....
26	5.55	4.55	6.1	5.2	4.52	5.3	.....
27	5.33	4.52	7.5	7.48	4.52	6.1	.....
28	5.3	4.58	9.4	6.7	5.08	6.2	.....
29	5.37	.....	8.45	6.15	4.9	5.7	.....
30	5.43	.....	8.35	5.85	4.75	5.35	.....
31	5.35	.....	8.1	.....	4.65	.....	.....

NOTE.—Backwater due to ice conditions February 4, 7–11, 17.

Rating table for North Fork of Shenandoah River, near Riverton, Va., from August 16, 1904, to July 14, 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.50	275	5.60	925	6.70	1,870	7.80	3,080
4.60	325	5.70	1,000	6.80	1,970	7.90	3,210
4.70	375	5.80	1,075	6.90	2,070	8.00	3,340
4.80	425	5.90	1,155	7.00	2,170	8.20	3,600
4.90	480	6.00	1,235	7.10	2,270	8.40	3,880
5.00	535	6.10	1,320	7.20	2,380	8.60	4,160
5.10	595	6.20	1,405	7.30	2,490	8.80	4,450
5.20	655	6.30	1,495	7.40	2,600	9.00	4,750
5.30	720	6.40	1,585	7.50	2,720		
5.40	785	6.50	1,680	7.60	2,840		
5.50	855	6.60	1,775	7.70	2,960		

NOTE.—The above table is applicable only for open-channel conditions. It is based on seven discharge measurements made during 1904–1906 after dam at Riverton was raised 2 feet. It is well defined between gage heights 4 feet and 5.5 feet. During August, 1904, the dam was raised 2 feet. The exact date is uncertain, but the table is assumed to apply from August 16, 1904.

Monthly discharge of North Fork of Shenandoah River near Riverton, Va., for 1906.

[Drainage area, 1,040 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	4,160	565	1,040	0.996	1.15
February	720	285	418	.402	.42
March	5,350	275	1,420	1.37	1.58
April	3,210	655	1,320	1.27	1.42
May	962	285	545	.524	.60
June	2,440	285	787	.757	.84
July 1-14	1,340	325	523	.503	.26

NOTE.—The discharge was estimated for February 4, 7-11, 17, when the gage was affected by backwater. Values are rated as follows: January to March, good; April to July, excellent.

PASSAGE CREEK AT BUCKTON, VA.

This station was established October 26, 1905, and was discontinued July 15, 1906. It is located about 700 feet above the mouth of the creek, at the trestle of the Southern Railway at Buckton, which is a siding 1 mile east of Waterlick, Va. Passage Creek is a tributary of North Fork of Shenandoah River. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 85, and in Water-Supply Paper No. 192, where are given also the data for previous years.

Discharge measurements of Passage Creek at Buckton, Va., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 13	Robert Follansbee	47	51	1.40	91
June 16	do	48	66	1.72	132

Daily gage height, in feet, of Passage Creek at Buckton, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	1.4	1.2	1.1	2.6	1.3	0.85	1.3
2	1.35	1.25	1.0	2.2	1.3	.95	1.2
3	1.3	1.3	1.1	1.9	1.3	.9	1.2
4	3.4	1.3	3.1	1.8	1.25	.85	1.2
5	2.0	1.3	2.2	1.7	1.25	.9	1.1
6	1.8	1.4	1.6	1.6	1.25	1.1	1.0
7	1.5	1.4	1.5	1.6	1.25	1.0	.9
8	1.5	1.6	1.5	1.5	1.3	.9	.9
9	1.5	1.7	1.5	1.3	1.25	.85	.85
10	1.55	1.6	1.4	1.9	1.2	.85	.85
11	1.55	1.5	1.3	1.6	1.2	.85	.85
12	1.5	1.5	1.3	1.5	1.2	1.1	.8
13	1.4	1.2	1.3	1.4	1.2	1.0	1.0
14	1.4	1.1	1.3	1.4	1.2	.9	.85
15	1.5	1.1	1.4	2.5	1.1	.9	.85
16	1.45	1.2	1.4	2.4	1.1	1.6	.....
17	1.4	1.15	1.35	2.0	1.0	2.55	.....
18	1.3	1.15	1.4	1.85	1.0	3.2	.....
19	1.3	1.1	1.6	1.7	1.0	2.2	.....
20	1.3	1.1	1.5	1.6	1.0	2.1	.....

Daily gage height, in feet, of Passage Creek at Buckton, Va., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
21	1.2	1.0	1.6	1.55	1.0	2.4	.....
22	1.2	1.0	1.8	1.5	.95	2.52	.....
23	1.2	1.0	2.2	1.4	.9	2.1	.....
24	1.25	1.0	2.1	1.4	.9	1.95	.....
25	1.2	1.0	2.1	1.4	.8	1.9	.....
26	1.2	1.0	2.1	1.4	.75	1.7	.....
27	1.2	1.0	2.6	1.65	.8	2.6	.....
28	1.25	1.1	3.4	1.5	.95	1.7	.....
29	1.2	.....	3.4	1.4	1.0	1.6	.....
30	1.2	.....	3.3	1.35	.9	1.4	.....
31	1.2	.....	2.6	.....	.85	.....	.....

NOTE.—Ice conditions February 4-13.

MONOCACY RIVER NEAR FREDERICK, MD.

This station was established August 4, 1896. It is located at the county bridge on the toll road leading from Frederick to Mount Pleasant, Md. It is 4 miles northeast of Frederick, about 2,000 feet above the mouth of Israel Creek, and 3,000 feet below the mouth of Tuscarora Creek. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 86, and in Water-Supply Paper No. 192, where are given also the data for previous years.

The following discharge measurement was made May 31, 1906:

Area, 324 square feet; gage height, 4.70 feet; discharge, 328 second-feet.

Daily gage height, in feet, of Monocacy River near Frederick, Md., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.2	4.9	5.3	9.7	5.4	4.7	4.5	4.5	5.5	4.3	5.6	4.5
2	5.7	4.8	5.5	7.8	5.4	4.7	4.5	9.1	5.2	4.3	5.5	4.5
3	7.5	4.5	9.1	7.4	5.3	4.6	4.5	16.1	5.1	4.3	5.3	4.5
4	18.35	4.5	16.65	6.9	5.3	4.5	5.3	10.1	4.9	4.8	5.2	4.5
5	12.6	5.1	9.1	6.5	5.2	4.4	5.1	5.5	4.9	7.1	5.1	4.5
6	7.6	5.0	6.9	6.3	5.3	4.4	4.6	5.3	4.8	6.1	5.0	4.7
7	6.7	4.9	6.5	6.2	5.3	4.4	4.6	5.1	4.7	5.8	4.9	4.8
8	6.6	4.8	6.4	6.1	5.3	4.4	4.5	4.9	4.6	4.9	4.8	4.8
9	6.2	5.2	6.3	7.5	5.2	4.4	4.5	4.8	4.6	4.7	4.8	4.7
10	5.9	5.1	6.1	16.8	5.0	5.5	4.4	4.8	4.5	4.6	4.8	5.0
11	5.7	5.0	5.9	9.1	5.0	5.1	4.4	6.1	4.4	4.5	4.8	6.8
12	6.9	4.9	5.8	8.5	4.9	4.5	4.9	5.1	4.4	4.4	4.7	6.4
13	6.7	4.8	5.8	7.1	4.9	4.5	4.5	6.1	4.4	4.3	4.7	5.3
14	6.2	5.9	5.8	6.9	4.9	4.4	4.4	4.8	4.4	4.3	4.7	5.2
15	6.5	8.1	5.8	21.8	4.7	4.4	4.4	4.7	4.4	4.3	4.8	5.2
16	7.1	5.4	5.8	15.5	4.8	4.5	4.4	4.6	4.4	4.3	4.8	7.6
17	6.9	4.9	5.7	10.2	4.8	4.6	4.5	4.6	4.4	4.3	4.8	9.8
18	6.2	4.8	5.7	8.1	4.7	7.1	4.5	4.5	4.4	4.3	4.9	12.1
19	5.9	5.0	5.6	7.5	4.7	9.7	4.4	8.5	4.4	9.5	5.2	8.5
20	5.7	5.0	5.6	7.1	4.5	9.5	4.4	7.5	4.4	13.2	5.5	6.5
21	5.7	5.4	5.5	6.7	4.5	10.5	4.3	6.5	4.8	9.5	5.1	9.5
22	5.7	9.4	5.5	6.4	4.5	10.7	4.4	5.4	4.6	11.5	5.0	7.5
23	5.6	6.5	5.5	6.3	4.5	6.7	4.8	7.35	4.4	8.5	4.9	6.9
24	5.6	6.1	5.6	6.1	4.5	6.1	5.1	6.5	4.4	7.5	4.8	5.8
25	5.6	6.7	5.6	5.9	4.4	5.9	4.8	7.5	4.4	8.5	4.7	5.7
26	5.5	6.9	5.5	5.8	4.5	5.8	4.6	7.8	4.3	8.1	4.6	5.6
27	5.5	5.9	9.0	5.7	4.5	5.1	4.4	11.0	4.3	7.5	4.6	7.8
28	5.55	6.1	17.45	5.5	5.6	4.9	4.35	9.8	4.3	6.7	4.6	6.9
29	5.3	.....	12.5	5.4	5.1	4.8	4.5	7.5	4.3	6.2	4.5	5.8
30	5.2	.....	10.5	5.4	4.8	4.7	4.3	6.1	4.3	5.8	4.5	5.7
31	5.1	.....	9.6	.....	4.7	.....	4.3	5.8	.....	5.7	.....	8.4

NOTE.—Ice conditions February 6, 7, and 9.

Rating table for Monocacy River near Frederick, Md., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.80	80	5.20	538	6.60	1,390	9.00	3,525
3.90	99	5.30	584	6.70	1,465	9.20	3,715
4.00	120	5.40	632	6.80	1,545	9.40	3,905
4.10	144	5.50	682	6.90	1,625	9.60	4,100
4.20	170	5.60	734	7.00	1,705	9.80	4,300
4.30	198	5.70	789	7.20	1,875	10.00	4,500
4.40	228	5.80	846	7.40	2,045	11.00	5,500
4.50	260	5.90	906	7.60	2,220	12.00	6,500
4.60	294	6.00	969	7.80	2,400	13.00	7,550
4.70	330	6.10	1,034	8.00	2,580	14.00	8,600
4.80	368	6.20	1,102	8.20	2,765		
4.90	408	6.30	1,172	8.40	2,955		
5.00	450	6.40	1,242	8.60	3,145		
5.10	493	6.50	1,315	8.80	3,335		

ote.—The above table is applicable only for open-channel conditions. It is based on discharge asurements made during 1900 to 1906. It is fairly well defined between gage heights 4 feet and 10 feet. ve 12 feet gage height the rating curve is a tangent, the difference being 105 per tenth.

Monthly discharge of Monocacy River near Frederick, Md., for 1906.

[Drainage area, 660 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ry	13,200	493	1,660	2.51	2.89
ary	3,900	260	824	1.25	1.30
	12,200	584	2,280	3.45	3.98
	16,800	632	2,880	4.36	4.86
	734	228	422	.639	.74
	5,200	228	1,040	1.57	1.75
	584	198	284	.430	.50
t	10,800	260	1,780	2.70	3.11
ber	682	198	290	.439	.49
r	7,760	198	1,490	2.25	2.59
ber	734	260	418	.633	.71
ber	6,600	260	1,430	2.17	2.50
The year	16,800	198	1,230	1.87	25.42

E.—Values for entire year are excellent.

ne following table gives the horsepower (80 per cent efficiency) per of fall that may be developed at different rates of discharge, and vs the number of days on which the flow and the corresponding epower were, respectively, less than the amounts given in the col- ns for "discharge" and "horsepower."

Daily gage height, in feet, of Passage Creek at Buckton, Va., for 1906—C

Day.	Jan.	Feb.	Mar.	Apr.	May.
21	1.2	1.0	1.6	1.55	1.0
22	1.2	1.0	1.8	1.5	.95
23	1.2	1.0	2.2	1.4	.9
24	1.25	1.0	2.1	1.4	.9
25	1.2	1.0	2.1	1.4	.8
26	1.2	1.0	2.1	1.4	.75
27	1.2	1.0	2.6	1.65	.8
28	1.25	1.1	3.4	1.5	.95
29	1.2	.....	3.4	1.4	1.0
30	1.2	.....	3.3	1.35	.9
31	1.2	.....	2.6	.....	.85

NOTE.—Ice conditions February 4-13.

MONOCACY RIVER NEAR FREDERICK, MD.

This station was established August 4, 1896. It is loca county bridge on the toll road leading from Frederick to Mo ant, Md. It is 4 miles northeast of Frederick, about 2,000 the mouth of Israel Creek, and 3,000 feet below the mouth of Creek. The conditions at this station and the bench described in Water-Supply Paper No. 167, page 86, and Supply Paper No. 192, where are given also the data fo years.

The following discharge measurement was made May 31

Area, 324 square feet; gage height, 4.70 feet; discharge, 328 second-fee

Daily gage height, in feet, of Monocacy River near Frederick, Md., fo

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	6.2	4.9	5.3	9.7	5.4	4.7	4.5	4.5	5.5	4.3
2	5.7	4.8	5.5	7.8	5.4	4.7	4.5	9.1	5.2	4.3
3	7.5	4.5	9.1	7.4	5.3	4.6	4.5	16.1	5.1	4.3
4	18.35	4.5	16.65	6.9	5.3	4.5	5.3	10.1	4.9	4.8
5	12.6	5.1	9.1	6.5	5.2	4.4	5.1	5.5	4.9	7.1
6	7.6	5.0	6.9	6.3	5.3	4.4	4.6	5.3	4.8	6.1
7	6.7	4.9	6.5	6.2	5.3	4.4	4.6	5.1	4.7	5.8
8	6.6	4.8	6.4	6.1	5.3	4.4	4.5	4.9	4.6	4.9
9	6.2	5.2	6.3	7.5	5.2	4.4	4.5	4.8	4.6	4.7
10	5.9	5.1	6.1	16.8	5.0	5.5	4.4	4.8	4.5	4.6
11	5.7	5.0	5.9	9.1	5.0	5.1	4.4	6.1	4.4	4.5
12	6.9	4.9	5.8	8.5	4.9	4.5	4.9	5.1	4.4	4.4
13	6.7	4.8	5.8	7.1	4.9	4.5	4.5	6.1	4.4	4.3
14	6.2	5.9	5.8	6.9	4.9	4.4	4.4	4.8	4.4	4.3
15	6.5	8.1	5.8	21.8	4.7	4.4	4.4	4.7	4.4	4.3
16	7.1	5.4	5.8	15.5	4.8	4.5	4.4	4.6	4.4	4.3
17	6.9	4.9	5.7	10.2	4.8	4.6	4.5	4.6	4.4	4.3
18	6.2	4.8	5.7	8.1	4.7	7.1	4.5	4.5	4.4	4.3
19	5.9	5.0	5.6	7.5	4.7	9.7	4.4	8.5	4.4	9.5
20	5.7	5.0	5.6	7.1	4.5	9.5	4.4	7.5	4.4	13.2
21	5.7	5.4	5.5	6.7	4.5	10.5	4.3	6.5	4.8	9.
22	5.7	9.4	5.5	6.4	4.5	10.7	4.4	5.4	4.6	11.
23	5.6	6.5	5.5	6.3	4.5	6.7	4.8	7.35	4.4	8.
24	5.6	6.1	5.6	6.1	4.5	6.1	5.1	6.5	4.4	[illegible]
25	5.6	6.7	5.6	5.9	4.4	5.9	4.8	7.5	4.4	
26	5.5	6.9	5.5	5.8	4.5	5.8	4.6	7.8	4.3	
27	5.5	5.9	9.0	5.7	4.5	5.1	4.4	11.0	4.3	
28	5.55	6.1	17.45	5.5	5.6	4.9	4.35	9.8	4.3	
29	5.3	.....	12.5	5.4	5.1	4.8	4.5	7.5	4.3	
30	5.2	.....	10.5	5.4	4.8	4.7	4.3	6.1	4.3	
31	5.1	.....	9.6	.....	4.7	.....	4.3	5.8	.....	

NOTE.—Ice conditions February 6, 7, and 9.

Discharge and horsepower table for Monocacy River at Frederick, Md., from 1896 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency), per foot fall.	Number of days of deficient flow.										
		1896.[a]	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
55	5	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....
66	6	.....	.....	.....	.....	16	.....	10	.....	.....	.....	.....
88	8	16	.....	.....	4	63	.....	22	.....	21	.....	.....
110	10	32	6	22	29	89	.....	29	.....	27	.....	.....
132	12	74	19	37	56	119	.....	38	.....	78	.....	.....
154	14	98	45	48	75	142	1	48	.....	85	2	.....
176	16	114	56	58	100	163	25	72	4	123	17	.....
198	18	115	63	59	100	165	25	72	4	123	17	.....
220	20	128	86	68	118	174	74	94	15	129	36	18
275	25	136	115	99	149	196	131	115	56	152	78	82
330	30	142	130	116	163	213	155	147	78	187	106	96
385	35	142	149	123	169	224	165	152	94	216	151	138
440	40	145	171	138	187	244	204	170	128	240	169	154
495	45	147	192	157	206	254	216	176	130	259	195	175
550	50	147	199	169	213	265	229	185	138	269	205	184
660	60	148	222	206	231	275	243	207	154	285	220	202
770	70	149	243	234	243	299	264	217	173	297	237	226

[a] August 4 to December 31.

NOTE.—During the period covered by the above table the minimum flow was 49 second-feet, giving 4.5 horsepower per foot of fall for four consecutive days.

JAMES RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The headwaters of the James lie in the high mountains in the extreme western part of Virginia. The river is formed by the confluence of Jackson and Cowpasture rivers in the northern part of Botetourt County, Va.; thence it flows eastward across the State and empties into Chesapeake Bay through Hampton Roads. The total length of the river is about 335 miles and its drainage area is about 9,700 square miles. The river and all its tributaries lie wholly within the State of Virginia.

The topography of the basin is varied in character, changing from the mountainous section in the upper part to low, flat, and often swampy areas as tide water is approached. Jackson and Cowpasture rivers flow in narrow valleys between steep hills, over beds of sand and gravel, with rock ledges in places, and are bordered with fertile bottom lands. In this portion of the basin the water collects quickly, causing rapid rises in the river below.

Near Clifton Forge and again near Balcony Falls the James flows through ridges of the Alleghenies, with sharp falls over beds of solid rock. At other points similar though less pronounced falls and rapids occur as the river cuts through the lesser foothills. Between these mountainous or hilly sections the stream winds through broad and fertile valleys over beds of sand and gravel, with gentle slope. The fall line is crossed at Richmond.

any dams have been built in the James, generally for diverting
r into the old James and Kanawha Canal, which followed the
r from Richmond to Buchanan and was at one time utilized
ughout that entire distance. It has now been abandoned, how-
, and its right of way is owned and for considerable distances
upied by the Chesapeake and Ohio Railway. The use of the dams
abandoned with the canal, and though many of them are in
l repair they have not been improved for power purposes. The
cipal utilized power is at Richmond. On October 19, 1904, a
surement of the James and Kanawha Canal was made about
iles above Richmond, Va., at a bridge opposite the 5-mile post
he Chesapeake and Ohio Railway. Area, 318 square feet; dis-
ge, 556 second-feet.

he fluctuations in stage are great. The records of the Carters-
station, which extend over a period of eight years, show a range
age height of nearly 25 feet. The discharge has varied between
00 and 600 second-feet.

1897 a reconnaissance survey of James River was made under
direction of D. C. Humphreys, professor of civil engineering of
hington and Lee University. This survey covered the portion
he river between Clifton Forge and Richmond and a part of
h River, and consisted in determining the profile, which was
by using the profile of the Chesapeake and Ohio Railway as a
and tying on to the water surface at each dam and at inter-
ate points not more than 5 miles apart. Notes were made in
d to the condition of the dams and measurements of flow were
e on all of the more important tributaries. The results of this
naissance were published in the Nineteenth Annual Report of
United States Geological Survey, Part IV, pages 162-173, and in
etin No. 3 of the Geological Survey of Virginia, Thomas L.
son, geologist in charge, Blacksburg, Va.

ages were established on James River in 1893 by F. B. Isaacs,
neer for water power of the Chesapeake and Ohio Railway Com-
, at Ninemile Locks, Columbia, Scottsville, Lynchburg, Balcony
s, Buchanan, Eagle Mountain, and Clifton Forge. Records of
hts of water at these points were made twice daily from 1893 to
and freshet reports were obtained for these years. The gages
e not referred to any fixed datum, but the zero of each gage was
at what was considered ordinary low water in the river. During
latter part of 1899 records were resumed, except at Scottsville,
cony Falls, and Eagle Mountain, where the gages have been
ndoned.

t Boshers dam, 9 miles above Richmond, is a gage where the
ght of water is recorded twice daily, showing the supposed head
the crest of the dam. The crest, however, is so irregular that

the coefficient of discharge has not been ascertained. Another complication exists in the fact that water is deflected into a canal, the quantity not being known.

The United States Weather Bureau maintains river stations on the James at Lynchburg, Columbia, and Richmond, Va.

JAMES RIVER AT BUCHANAN, VA.

This station was established August 18, 1895, and was discontinued July 15, 1906. It is located at the iron highway bridge near the Chesapeake and Ohio Railway station and one-half mile from the Norfolk and Western Railway station. It is about 20 miles from the mouth of North River and one-half mile above the mouth of Purgatory Creek. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 91, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 12, 1906:

Width, 319 feet; area, 1,010 square feet; gage height, 2.31 feet; discharge, 72 second-feet.

Daily gage height, in feet, of James River at Buchanan, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	3.64	4.13	2.45	6.24	3.2	2.7	2.2
3	3.42	3.88	2.35	5.42	3.1	2.61	2.2
3	3.39	3.56	2.55	4.95	3.14	2.59	2.2
4	7.9	3.42	4.21	4.42	2.96	2.4	4.2
5	7.08	3.34	5.39	4.35	3.02	2.31	2.9
6	5.49	3.2	4.22	4.0	3.45	2.72	2.7
7	4.72	3.19	3.91	4.05	3.55	2.64	2.6
8	4.18	3.09	3.55	3.84	3.4	2.52	2.3
9	3.93	2.9	3.52	3.8	3.36	2.51	2.26
10	3.55	2.94	3.28	4.28	3.12	2.34	2.2
11	3.39	2.93	3.24	4.92	3.1	2.3	2.19
12	3.33	2.7	3.01	4.46	2.94	2.34	2.12
13	3.39	2.77	3.01	4.25	2.91	2.3	2.22
14	3.55	2.75	2.85	3.9	2.7	2.45	2.31
15	3.55	2.65	3.38	4.48	2.78	2.4	2.32
16	3.81	2.72	7.00	5.5	2.65	2.4	.....
17	3.86	2.66	5.9	5.01	2.8	2.35	.....
18	3.79	2.49	4.83	4.4	2.9	2.55	.....
19	3.62	2.5	4.59	4.25	2.96	2.5	.....
20	3.41	2.5	4.67	3.92	2.76	4.12	.....
21	3.35	2.4	4.89	3.85	2.78	4.75	.....
22	3.46	2.5	4.63	3.6	2.6	3.96	.....
23	9.41	2.52	4.65	3.59	2.66	3.58	.....
24	9.16	2.45	4.28	3.4	2.49	3.16	.....
25	6.34	2.55	4.23	3.38	2.5	2.92	.....
26	5.4	2.53	3.88	3.12	2.36	2.79	.....
27	4.86	2.43	5.4	3.22	2.68	2.6	.....
28	4.83	2.5	7.88	3.1	2.75	2.6	.....
29	5.0	.....	7.14	3.2	2.8	2.59	.....
30	4.6	.....	6.16	3.1	2.9	2.51	.....
31	4.37	.....	6.46	.....	2.94	.....	.....

NOTE.—Discharge probably unaffected by ice.

Rating table for James River at Buchanan, Va., for 1898–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.10	505	3.30	1,815	4.50	4,025	6.40	8,495
2.20	575	3.40	1,965	4.60	4,235	6.60	9,030
2.30	655	3.50	2,125	4.70	4,450	6.80	9,575
2.40	740	3.60	2,290	4.80	4,665	7.00	10,130
2.50	835	3.70	2,460	4.90	4,885	7.20	10,700
2.60	935	3.80	2,640	5.00	5,105	7.40	11,290
2.70	1,040	3.90	2,825	5.20	5,555	7.60	11,900
2.80	1,155	4.00	3,015	5.40	6,015	7.80	12,520
2.90	1,275	4.10	3,210	5.60	6,485	8.00	13,140
3.00	1,400	4.20	3,410	5.80	6,965	9.00	16,470
3.10	1,530	4.30	3,610	6.00	7,460	10.00	20,300
3.20	1,670	4.40	3,815	6.20	7,970		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 17 discharge measurements made during 1901-1906. It is well defined between gage heights 1.8 feet and 4.5 feet. Below 4.5 to 8.5 feet it is determined by two measurements made in 1901. Above gage height 8.5 feet it is determined by the product of the area and velocity curves, but these are somewhat uncertain. A control below the station causes the discharge measurements to plot on a fairly permanent curve.

Monthly discharge of James River at Buchanan, Va., for 1906.

[Drainage area, 2,060 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
...ry	18,000	1,860	4,750	2.31	2.66
...ary	3,270	740	1,300	.631	.66
...	12,800	698	4,250	2.06	2.38
...	8,070	1,530	3,390	1.65	1.84
...	2,210	706	1,310	.636	.73
...	4,560	655	1,180	.573	.64
...-15	3,450	519	888	.431	.24

NOTE.—Values for 1906 are excellent.

he following table gives the horsepower (80 per cent efficiency) foot of fall that may be developed at different rates of discharge shows the number of days on which the flow and the correspond- horsepower were respectively less than the amounts given in the mns for "discharge" and "horsepower."

charge and horsepower table for James River at Buchanan, Va., from 1895 to 1906.

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.											
		1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
275	25	.....	a 2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
330	30	.....	a 8	25	6	71	16	.....	.....	.....	16	.....	.....
385	35	11	a 13	44	9	112	30	.....	18	.....	71	8	.....
440	40	59	a 13	67	9	112	31	.....	18	.....	105	19	.....
495	45	65	35	84	12	134	46	9	50	.....	126	70	.....
550	50	81	54	101	22	153	72	20	84	40	136	86	1
660	60	119	81	119	45	171	107	42	119	95	160	120	11
770	70	.....	105	146	52	178	125	52	139	115	181	146	24
880	80	.....	142	182	88	184	144	70	154	128	199	166	41
990	90	.....	165	191	102	194	163	89	166	138	213	187	52
1,100	100	.....	205	209	136	196	176	103	176	154	220	200	63
1,320	120	.....	235	238	175	202	207	132	205	172	234	222	80
1,540	140	.....	262	256	195	214	234	154	224	187	242	236	92

a 1896 a discharge of less than 495 second-feet occurred only in April and May. As the determina- for these months are known to be of doubtful value, they should be disregarded altogether in any r estimates.

NOTE.—The minimum discharge from 1895 to 1906 was 275 second-feet, giving 25 horsepower per foot l, on eleven *consecutive days in October, 1899,* and on three consecutive days in August and in *mber, 1900.*

JAMES RIVER AT HOLCOMB ROCK, VA.

This station was established by the Willson Aluminum Company, of Holcomb Rock, Va., in 1899, in connection with measurements to determine the horsepower available at that point. During 1899 the records were fragmentary, but at the beginning of 1900 daily records were taken, which have been furnished to the United States Geological Survey through the courtesy of the general manager of the company. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 93, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of James River, at Holcomb Rock, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	2.9	1.3	5.75	1.75	1.6	1.4	1.5	3.8	3.45	2.25	1.65
2	3.75	2.75	1.3	4.9	1.8	1.7	1.5	1.4	2.65	3.8	2.2	1.6
3	3.0	2.45	1.7	4.05	1.75	1.35	1.05	1.3	2.45	5.85	2.1	1.7
4	2.5	2.0	4.2	3.6	1.7	1.3	2.05	1.3	2.25	9.55	1.95	1.7
5	2.4	2.1	4.8	3.15	1.7	1.3	1.85	1.0	2.05	9.65	1.85	1.6
6	2.55	2.1	3.7	2.95	1.55	1.5	1.55	1.5	1.9	6.6	1.7	1.7
7	3.0	2.0	2.9	2.75	2.25	1.55	1.45	2.0	1.8	5.65	1.7	1.6
8	3.3	1.75	2.55	2.55	2.1	1.35	1.1	2.35	1.7	4.65	1.7	1.6
9	2.95	1.7	2.35	2.6	2.05	1.3	1.15	2.1	1.6	3.85	1.7	1.6
10	2.55	1.7	2.3	3.15	2.0	1.15	1.2	2.05	1.55	3.2	1.65	1.5
11	2.2	1.7	2.0	3.75	1.85	1.25	1.2	1.7	1.5	2.7	1.55	1.6
12	2.1	1.55	2.0	3.4	1.8	1.3	1.2	1.6	1.55	2.45	1.65	1.5
13	2.1	1.6	1.9	3.1	1.55	1.3	1.1	1.7	1.85	2.15	1.7	1.5
14	2.4	1.55	1.85	2.7	1.6	1.4	1.2	2.15	2.25	2.0	1.65	1.4
15	2.4	1.55	2.25	3.3	1.55	1.3	1.1	3.45	1.8	1.95	1.6	1.4
16	2.55	1.5	5.4	4.6	1.5	1.3	1.35	4.2	1.5	1.85	1.6	1.6
17	2.55	1.5	5.15	4.4	1.5	1.1	1.3	4.05	1.35	1.8	1.6	1.6
18	2.5	1.25	3.7	3.65	1.6	1.4	1.2	3.6	1.35	3.4	1.55	4.7
19	2.5	1.5	3.6	3.2	1.65	1.5	1.25	3.0	1.4	13.4	3.95	6.8
20	2.3	1.45	3.85	2.9	1.6	4.75	1.3	3.2	1.4	19.0	9.85	4.3
21	2.0	1.35	3.9	2.65	1.5	4.5	1.1	3.2	1.3	12.3	7.85	3.7
22	2.05	1.4	3.85	2.55	1.4	3.55	1.2	2.9	1.4	8.1	5.3	3.3
23	5.85	1.3	3.4	2.4	1.3	2.65	1.7	2.75	1.6	6.3	4.2	3.3
24	9.85	1.4	3.3	2.25	1.3	2.05	1.4	2.8	1.9	5.45	3.35	2.8
25	6.3	1.1	2.95	2.1	1.3	1.95	1.3	2.9	1.65	4.4	2.85	2.5
26	4.7	1.35	2.9	2.1	1.3	1.7	1.3	2.8	1.55	3.8	2.65	2.3
27	4.0	1.35	3.65	2.0	1.3	2.1	1.3	2.75	1.4	3.4	2.45	2.2
28	3.75	1.3	7.1	2.0	1.5	1.65	1.3	4.75	1.6	3.2	2.25	2.2
29	4.1	.....	6.5	1.85	1.6	1.85	1.5	5.9	2.15	2.85	2.05	2.2
30	3.8	.....	5.8	1.75	1.8	1.6	2.05	4.6	2.25	2.5	1.85	2.1
31	3.35	.....	5.85	.....	1.7	.....	1.7	3.85	.....	2.35	.....	3.1

JAMES RIVER AT CARTERSVILLE, VA.

This station was established January 1, 1899. It is located at the highway bridge crossing the James between Pemberton and Cartersville, 300 yards from the railroad station, and 50 miles above Richmond, Va. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 94, where are given also references to publications that contain data for previous years.

'he following discharge measurement was made June 7, 1906:

idth, 690 feet; area, 2,100 square feet; gage height, 2.22 feet; discharge, 3,400 nd-feet.

Daily gage height, in feet, of James River at Cartersville, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.98	5.37	2.22	8.62	2.9	2.6	3.0	2.98	6.03	4.88	3.95	3.1
.....	4.38	4.3	2.4	8.2	2.88	4.85	2.15	3.75	5.38	3.50	3.65	2.95
.....	3.85	4.2	2.52	6.95	2.8	3.62	1.9	3.6	4.55	5.15	3.45	2.8
.....	17.0	3.38	10.1	6.05	2.8	2.59	1.85	2.78	3.97	12.4	3.22	2.7
.....	12.2	3.6	8.25	5.32	2.7	2.1	2.5	2.55	3.52	15.2	3.1	2.7
.....	11.2	3.5	7.05	4.9	2.78	2.05	2.38	2.2	3.15	11.9	3.0	2.62
.....	7.9	3.3	5.85	4.6	2.75	2.08	2.42	1.7	2.92	9.4	2.9	2.5
.....	5.15	3.15	4.9	4.25	3.8	2.05	2.15	2.92	2.7	7.2	2.8	2.48
.....	5.35	3.08	4.38	4.15	3.3	2.08	1.85	2.98	2.5	6.65	2.72	2.45
.....	4.7	3.45	3.95	5.45	2.9	1.97	1.6	4.0	2.4	5.52	2.65	2.35
.....	4.1	3.0	3.5	5.02	2.9	1.8	1.6	3.72	2.05	4.82	2.75	2.35
.....	3.85	2.82	3.3	5.2	2.72	1.7	1.6	3.65	2.2	4.12	2.85	2.5
.....	3.8	2.65	3.15	5.15	2.6	1.6	1.68	4.82	2.5	3.62	2.85	2.38
.....	3.9	2.8	3.02	4.7	2.55	1.65	1.55	3.72	3.15	3.25	2.68	2.3
.....	4.12	2.65	3.3	10.0	2.25	1.85	1.42	2.95	2.55	3.12	2.55	2.25
.....	4.1	2.5	8.65	9.4	2.35	1.75	1.3	4.32	2.4	2.9	2.65	2.2
.....	4.0	2.4	6.45	7.25	2.28	2.0	1.6	5.58	2.25	2.82	2.58	2.2
.....	3.95	2.32	6.95	6.82	2.2	2.4	1.7	9.32	2.08	3.1	2.48	3.8
.....	3.9	2.38	5.98	5.9	2.15	1.88	1.6	6.75	2.15	7.8	8.9	3.75
.....	3.7	2.1	8.7	5.15	2.12	1.98	1.58	5.32	2.38	21.8	9.95	8.2
.....	3.55	2.3	6.95	4.75	2.2	5.2	2.72	5.65	2.11	23.3	10.8	7.48
.....	3.32	2.38	6.58	4.47	2.0	7.05	2.3	4.82	2.02	18.7	10.2	6.0
.....	3.28	2.45	5.62	4.15	2.8	6.85	2.88	6.55	2.0	12.2	7.3	5.25
.....	3.95	2.3	5.0	3.95	1.9	4.47	3.3	4.6	2.2	9.55	5.95	4.72
.....	11.3	2.2	4.92	3.58	1.78	3.68	2.5	7.0	2.3	8.05	4.85	4.15
.....	7.82	2.15	4.71	3.49	1.75	3.08	1.9	5.35	2.32	7.08	4.45	3.62
.....	6.22	2.0	5.3	3.48	2.72	5.3	1.65	6.28	2.25	6.2	4.18	3.3
.....	9.0	2.2	5.71	3.5	2.85	3.65	1.95	9.05	2.05	5.9	3.82	3.5
.....	7.6	.....	8.2	3.15	4.75	3.6	2.75	7.45	2.02	5.0	3.45	3.42
.....	6.3	.....	9.05	2.95	3.48	3.45	5.4	9.1	2.35	4.55	3.22	3.3
.....	5.85	.....	10.5	.....	3.28	.....	4.35	7.55	.....	4.2	.....	3.35

E.—Discharge probably unaffected by ice.

Rating table for James Rvier at Cartersville, Va., for 1899-1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.30	2,170	3.00	5,550	4.70	9,530	7.80	18,330
1.40	2,350	3.10	5,770	4.80	9,780	8.00	18,970
1.50	2,530	3.20	5,990	4.90	10,040	9.00	22,300
1.60	2,710	3.30	6,210	5.00	10,300	10.00	25,750
1.70	2,900	3.40	6,440	5.20	10,820	11.00	29,260
1.80	3,090	3.50	6,670	5.40	11,350	12.00	32,930
1.90	3,280	3.60	6,900	5.60	11,890	13.00	36,670
2.00	3,480	3.70	7,130	5.80	12,430	14.00	40,520
2.10	3,680	3.80	7,360	6.00	12,980	15.00	44,500
2.20	3,880	3.90	7,590	6.20	13,540	16.00	48,600
2.30	4,080	4.00	7,830	6.40	14,100	17.00	52,820
2.40	4,280	4.10	8,070	6.60	14,680	18.00	57,200
2.50	4,490	4.20	8,310	6.80	15,260	19.00	61,700
2.60	4,700	4.30	8,550	7.00	15,840	20.00	66,300
2.70	4,910	4.40	8,790	7.20	16,460	21.00	71,200
2.80	5,120	4.50	9,030	7.40	17,080	22.00	76,900
2.90	5,330	4.60	9,280	7.60	17,700	23.00	82,900

OTE.—The above table is applicable only for open-channel conditions. It is based on 25 discharge surements made during 1897–1906. It is well defined between gage heights 0.7 foot and 10 feet. ween gage heights 10 feet and 20 feet the table is the product of the area curve by the extension ie velocity curve. Above 20 feet estimates are obtained in the same way, with the addition of a ll overflow discharge.

Monthly discharge of James River at Cartersville, Va., for 1906.

[Drainage area, 6,230 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inche
January	52,800	6,170	13,800	2.22	
February	11,300	3,480	5,380	.863	
March	27,500	3,920	12,700	2.04	
April	25,800	5,440	11,600	1.86	
May	9,660	3,000	4,910	.789	
June	16,000	2,710	5,850	.939	
July	11,400	2,170	4,020	.645	
August	23,400	2,900	10,600	1.70	
September	13,100	3,480	5,110	.820	
October	84,800	5,160	20,800	3.34	
November	28,600	4,450	9,230	1.48	
December	19,600	3,880	6,750	1.08	
The year	84,800	2,170	9,230	1.48	

NOTE.—Values for entire year are excellent.

The following table gives the horsepower (80 per cent efficien per foot of fall that may be developed at different rates of dischar and shows the number of days on which the flow and the correspo ing horsepower were respectively less than the amounts given in columns for "discharge" and "horsepower:"

Discharge and horsepower table for James River at Cartersville, Va., from 1899 to 1

Discharge in second-feet.	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.							
		1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
880	80		3						
990	90		3		8		11		
1,100	100		12		13		15		
1,320	120	4	19		22		40		
1,540	140	14	31		34		75		
1,760	160	42	59		48		95	13	
1,980	180	66	75		52	1	100	32	
2,200	200	109	92	2	78	25	115	59	1
2,750	250	140	112	48	113	78	154	92	10
3,300	300	158	123	70	138	111	186	132	27
3,850	350	176	152	100	158	128	213	155	52
4,400	400	191	180	124	173	149	234	182	91
4,950	450	198	200	145	179	162	245	200	116
5,500	500	209	216	159	189	178	254	227	151

NOTE.—The ice conditions at this station during some of the winter months did not materially a the results given in the above table.
Minimum flow from 1899 to 1906 was 842 second-feet, giving 77 horsepower on 3 days in September,

ROANOKE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Dan River joins the Roanoke at Clarksville, Mecklenburg Coun Va., 185 miles above its mouth, and is its largest tributary. T Roanoke drains a total area of 9,200 square miles, and empties i *Albemarle* Sound a short distance below Plymouth, N. C. It is na *gable at all* stages for 120 miles, to Weldon, N. C., where it crosses

fall line. The Dan and the Roanoke above their junction drain, respectively, 3,800 and 3,550 square miles. The Roanoke is the more northerly of the two, and its drainage basin lies entirely in Virginia. It rises among the eastern foothills of the Blue Ridge, southwest of Roanoke and Salem, and flows at first northeast, then southeast to its junction with the Dan. The Dan rises in Surry County, N. C., and Patrick County, Va., and flows at first southeast, then northeast to its junction with the Roanoke. A large part of the drainage area of the Dan lies in North Carolina.

During 1905 a survey of Roanoke River was made in order to determine a plan and profile and other information which would be of use in hydraulic developments. For description, plan, and profile of this survey see Bulletin No. 3 of the Geological Survey of Virginia.

The rainfall on the basin of the Roanoke above the fall line is about 48 inches per annum, and is evenly distributed throughout the year. The average amount probably increases slightly as the stream is ascended, though the records of rainfall over the basin are too incomplete to decide this matter. The slopes in the headwaters and in the upper tributaries are steep, freshets on the river are violent, and the fluctuations of height occur with great rapidity. Rises of 50 feet and over have been noted at Weldon, and freshets in which the rate of rise is 10 feet a day or more are frequent.

The United States Weather Bureau maintains gages at Clarksville, Va., at the junction of the Dan and Roanoke; on Dan River at Danville, Va., and on Roanoke River at Weldon, N. C.

ROANOKE RIVER AT ROANOKE, VA.

This station was established July 10, 1896, and was discontinued July 15, 1906. The gage is located at the Walnut Street Bridge, Roanoke, but the measuring section is at the Jefferson Street Bridge. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 102, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 10, 1906:

Width, 112 feet; area, 124 square feet; gage height, .76 feet; discharge, 119 second-feet.

Daily gage height, in feet, of Roanoke River at Roanoke, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	1.35	1.8	1.0	2.3	1.35	1.1	0.8
2	1.3	1.7	1.1	2.05	1.3	1.0	.8
3	4.8	1.6	1.15	1.75	1.3	.9	.75
4	3.6	1.5	1.7	1.65	1.2	.7	.75
5	2.8	1.5	1.5	1.55	1.1	.8	.7
6	2.15	1.5	1.4	1.5	1.2	.8	.7
7	1.85	1.4	1.3	1.45	1.3	.8	.7
8	1.75	1.4	1.3	1.4	1.3	.8	.7
9	1.65	1.35	1.3	1.4	1.3	.7	.7
10	1.5	1.3	1.2	1.7	1.1	.8	.7

Daily gage height, in feet, of Roanoke River at Roanoke, Va., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Jul
11	1.5	1.2	1.2	1.6	1.1	.8	
12	1.5	1.2	1.2	1.55	1.1	.8	
13	1.4	1.2	1.2	1.4	1.0	1.4	
14	1.4	1.2	1.15	1.4	1.0	1.3	
15	1.5	1.2	1.4	1.8	.9	1.2	
16	1.5	1.2	1.5	2.0	1.0	1.1	...
17	1.5	1.2	2.0	1.85	1.0	1.0	...
18	1.45	1.1	2.1	1.7	1.0	1.0	...
19	1.4	1.1	2.2	1.6	1.0	.9	...
20	1.35	1.1	2.2	1.5	.9	.8	...
21	1.3	1.1	2.2	1.4	1.4	1.1	...
22	1.3	1.05	2.1	1.6	1.3	1.0	...
23	4.05	1.05	2.0	1.5	1.4	.9	...
24	2.7	1.05	1.8	1.4	1.4	.8	...
25	2.2	1.05	1.7	1.3	1.2	.8	...
26	2.05	1.05	1.6	1.3	1.1	.8	...
27	1.85	1.1	2.15	1.2	1.0	.8	...
28	1.3	1.0	2.2	1.15	1.0	.8	...
29	2.2	.....	2.1	1.5	1.0	.8	...
30	2.0	.....	2.05	1.4	.9	.8	...
31	1.9	.....	2.0	.....	1.1	.....	...

NOTE.—Discharge probably unaffected by ice.

Rating table for Roanoke River at Roanoke, Va., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.60	74	1.60	470	2.60	1,240	3.60	2,390
.70	96	1.70	530	2.70	1,340	3.70	2,515
.80	122	1.80	590	2.80	1,440	3.80	2,645
.90	152	1.90	655	2.90	1,550	3.90	2,775
1.00	186	2.00	725	3.00	1,660	4.00	2,905
1.10	224	2.10	800	3.10	1,780	4.20	3,175
1.20	264	2.20	880	3.20	1,900	4.40	3,445
1.30	310	2.30	960	3.30	2,020	4.60	3,715
1.40	360	2.40	1,050	3.40	2,140	4.80	3,985
1.50	415	2.50	140	3.50	2,265		

NOTE.—The above table is applicable only for open-channel conditions. It is based on disc measurements made during 1896–1906. It is fairly well defined.

Monthly discharge of Roanoke River at Roanoke, Va., for 1906.

[Drainage area, 388 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dept inch
January	3,980	310	808	2.08	
February	590	186	299	.771	
March	880	186	524	1.35	
April	960	244	459	1.18	
May	360	152	243	.626	
June	360	96	161	.415	
July 1–15	122	85	99	.255	

NOTE.—Values for entire year are good.

The following table gives the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge, and shows the number of days on which the flow and the corresponding horsepower were, respectively, less than the amounts given in the columns for "discharge" and "horsepower."

Discharge and horsepower table for Roanoke River at Roanoke, Va., from 1896 to 1906.

Discharge in second-feet	Horsepower (80 per cent efficiency) per foot fall.	Number of days of deficient flow.										
		1896.[a]	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.[b]
66	6	.....	8	.....	.....	1	.....	.....	.....	.....	.....	.....
88	8	36	101	21	43	43	.....	70	6	7	2	3
110	10	111	142	39	125	66	.....	108	17	78	7	15
132	12	120	156	48	140	80	1	121	31	132	55	32
154	14	126	182	83	167	107	9	144	87	164	101	38
176	16	127	182	95	179	127	29	154	103	181	115	38
198	18	129	194	110	185	150	51	162	124	217	135	53
220	20	129	195	122	194	165	70	174	136	238	139	58
275	25	134	206	137	205	190	112	198	173	287	188	92
330	30	139	216	155	218	215	145	220	195	302	227	109

[a] July to December, 1896. [b] January to July 15, 1906.

NOTE.—The minimum flow during the period covered by the above table was 58 second-feet, giving 5.3 horsepower per foot of fall on one day in February, 1900.

ROANOKE RIVER[a] AT RANDOLPH, VA.

This station was originally established August 27, 1900. It is located on the railroad bridge about five-eighths mile southwest of the Southern Railway station at Randolph. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 104, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 8, 1906:

Width, 237 feet; area, 735 square feet; gage height, 4.20 feet; discharge, 1,440 second-feet.

Daily gage height, in feet, of Roanoke River at Randolph, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	10.3	11.5	5.75	9.85	4.65	5.6	5.95	8.5
2	8.65	10.1	5.75	7.95	4.8	5.4	5.65	6.55
3	6.6	7.5	5.6	7.15	4.9	5.4	5.3	6.4
4	12.9	6.2	5.75	6.75	4.8	5.4	5.05	6.85
5	23.6	6.2	5.85	6.45	4.65	5.6	4.85	7.1
6	19.8	6.35	5.9	6.4	4.85	5.5	4.75	7.3
7	7.65	6.3	6.15	6.15	5.15	5.45	4.75	7.1
8	6.7	6.25	6.0	5.95	5.7	5.15	4.55	6.9
9	6.75	6.25	5.85	6.35	6.05	5.25	4.55	6.7
10	6.9	7.05	5.75	7.5	5.9	5.35	4.85	7.4
11	6.85	6.85	5.85	8.95	5.55	5.1	5.25	7.5
12	6.95	6.65	5.85	9.15	5.5	5.15	5.8	.....
13	7.15	6.25	5.85	8.65	5.0	5.05	5.9	.....
14	7.25	5.7	5.75	7.3	5.05	4.95	5.65	.....
15	6.75	6.05	5.65	8.25	4.9	5.2	5.45	.....

[a] *Called Staunton River* in reports prior to 1905.

Daily gage height, in feet, of Roanoke River at Randolph, Va., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
16	6.55	5.85	5.65	8.2	4.85	5.2	5.25	.....
17	6.35	5.65	5.85	7.5	4.65	5.25	4.75	.....
18	6.3	5.45	8.85	7.35	4.75	5.35	4.45	.....
19	5.85	5.35	7.7	7.35	4.65	5.65	4.25	.....
20	5.4	5.35	13.0	7.4	4.65	5.15	4.4	.....
21	5.85	5.25	11.0	7.0	4.45	7.2	5.05	.....
22	5.85	5.35	9.1	6.75	4.45	9.35	5.55	.....
23	5.65	5.15	7.75	6.45	4.2	6.95	6.5	.....
24	5.75	4.95	7.05	6.45	4.1	5.1	6.15	.....
25	5.6	4.95	6.8	6.3	3.9	7.75	5.3	.....
26	5.8	4.85	6.75	5.95	4.1	7.4	4.6	.....
27	6.05	5.15	6.75	5.65	4.45	6.65	4.55	.....
28	10.6	5.35	7.15	5.6	5.75	6.35	4.25	.....
29	11.55	.....	7.35	5.25	8.9	6.65	4.5	.....
30	12.4	.....	8.75	5.0	8.3	6.25	7.45	.....
31	12.5	.....	15.6	.....	6.55	.....	7.75	.....

NOTE.—Discharge probably unaffected by ice.

DAN RIVER AT MADISON, N. C.

This station was established May 14, 1903. It is located at the Southern Railway bridge about one-fourth mile from Madison and one-half mile above the mouth of Mayo River. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 107, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 21, 1906:

Width, 142 feet; area, 374 square feet; gage height, 2.37 feet; discharge, 72[illegible] second-feet.

Daily gage height, in feet, of Dan River at Madison, N. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	3.0	2.25	3.4	1.75	1.3	1.7	3.3	3.9	2.9	2.35	[illegible]
2	2.15	2.6	2.0	2.75	1.85	1.2	1.65	4.0	3.1	2.7	2.3	[illegible]
3	2.0	2.25	1.7	2.4	1.95	1.2	2.0	4.3	2.9	2.5	2.2	[illegible]
4	17.9	2.0	5.4	2.4	2.0	1.15	1.85	2.6	3.1	5.9	2.15	[illegible]
5	5.4	2.1	3.1	2.3	2.05	1.1	1.7	2.15	2.85	3.6	2.15	[illegible]
6	3.7	2.3	2.65	2.25	1.7	6.1	1.6	2.15	2.5	2.9	2.15	[illegible]
7	2.9	2.2	2.3	2.25	2.4	1.9	1.8	1.9	2.3	3.2	2.1	[illegible]
8	2.75	2.1	2.1	2.05	2.15	2.0	1.5	1.9	2.2	2.9	2.1	[illegible]
9	2.55	2.0	2.1	2.1	1.85	1.9	4.8	1.8	2.1	2.45	2.1	[illegible]
10	2.35	2.2	2.0	2.7	1.5	1.8	2.9	1.8	2.05	3.1	2.05	[illegible]
11	2.2	2.1	1.8	2.45	1.5	2.5	1.8	1.8	1.9	2.6	2.05	[illegible]
12	2.25	2.0	1.75	2.1	1.5	1.85	1.45	1.6	1.8	2.1	2.15	[illegible]
13	4.2	2.0	1.75	2.05	1.5	2.0	1.5	5.2	5.4	2.0	2.1	[illegible]
14	4.8	2.0	1.7	2.0	1.45	3.6	1.5	3.1	3.5	2.0	2.1	[illegible]
15	3.4	1.9	2.15	3.1	1.45	3.1	1.4	5.0	2.4	1.95	2.05	[illegible]
16	3.0	1.8	5.3	2.8	1.4	3.5	5.0	14.9	2.1	1.9	2.15	[illegible]
17	2.75	1.7	3.2	2.45	1.3	4.0	2.4	15.5	2.1	2.0	2.1	[illegible]
18	2.4	1.8	2.6	2.25	1.3	3.2	4.5	14.3	2.1	2.3	2.0	[illegible]
19	2.3	1.75	2.15	2.15	1.3	2.5	2.3	5.9	2.0	9.3	2.5	[illegible]
20	2.2	1.7	7.4	2.1	1.25	3.9	2.3	7.6	3.5	7.5	4.6	[illegible]
21	2.15	1.65	4.0	2.05	1.25	2.5	6.3	4.2	2.65	5.0	3.2	[illegible]
22	2.0	3.2	2.8	1.95	1.25	3.3	6.5	3.2	2.4	4.2	2.8	[illegible]
23	10.1	2.8	2.6	1.95	1.25	2.35	6.3	2.9	3.0	3.6	2.5	[illegible]
24	6.6	2.25	2.45	1.9	1.2	1.8	2.4	2.7	2.85	3.2	2.3	[illegible]
25	4.4	2.0	2.15	1.8	1.2	3.3	4.4	2.5	2.75	3.0	2.2	[illegible]
26	3.2	1.9	2.7	1.75	1.15	6.2	2.1	2.65	2.4	2.9	2.2	[illegible]
27	6.1	1.75	2.6	1.7	2.2	2.7	1.8	3.2	2.2	2.8	2.15	[illegible]
28	6.4	2.65	2.5	1.7	2.0	2.0	4.2	6.1	2.0	2.7	2.1	[illegible]
29	4.6	.....	2.55	1.65	1.6	1.9	2.4	8.6	2.0	2.5	2.1	[illegible]
30	3.9	.....	2.9	1.7	1.5	1.8	7.7	7.5	2.1	2.5	2.05	[illegible]
31	3.4	.....	5.0	.....	1.4	.....	6.8	5.8	.....	2.4	.....	[illegible]

NOTE.—Discharge probably unaffected by ice.

DAN RIVER AT SOUTH BOSTON, VA.

This station was established August 27, 1900. It is located in South Boston, on the Norfolk and Western Railway bridge, which crosses the river at that place. The conditions at this station and the bench marks are described in Water-Supply Paper No. 167, page 109, where are given also references to publications that contain data for previous years.

The following discharge measurement was made June 9, 1906:

Width, 252 feet; area, 1,310 square feet; gage height, 213 feet; discharge, 1,850 second-feet.

Daily gage height, in feet, of Dan River at South Boston, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.25	2.9	4.28	8.75	2.6	1.68	2.6	3.35	4.18	2.55	3.0	1.98
2	3.95	2.25	4.12	5.75	2.3	1.38	2.28	4.2	4.25	5.85	3.1	2.08
3	4.55	2.25	4.35	4.5	2.4	1.45	2.0	3.4	4.05	3.95	2.85	2.02
4	16.1	2.05	5.0	4.4	2.55	1.58	2.05	3.65	5.95	4.15	2.55	2.05
5	19.7	3.75	5.65	3.8	2.18	1.55	2.18	3.25	4.6	8.75	2.35	2.15
6	18.0	4.3	4.8	3.52	2.3	1.4	3.7	3.75	3.88	7.32	2.3	2.35
7	9.6	3.02	3.82	2.7	3.48	1.6	3.95	3.3	3.28	4.95	2.08	2.4
8	6.6	3.85	3.45	3.08	3.95	1.65	4.0	3.08	2.85	3.6	2.18	2.22
9	5.62	4.65	3.42	3.7	3.02	1.75	3.5	3.32	2.62	2.5	2.22	2.28
10	3.75	4.5	3.1	5.25	2.2	3.65	3.45	3.2	2.15	1.25	2.4	2.42
11	3.35	3.8	2.75	5.1	2.25	4.82	3.05	4.08	1.82	1.1	2.35	2.52
12	4.2	3.6	2.3	4.08	2.35	3.58	2.75	4.4	1.9	1.18	2.6	2.55
13	3.4	3.18	2.58	3.45	2.5	2.7	2.22	4.75	1.85	.95	2.55	2.62
14	5.0	3.18	2.9	3.88	2.18	2.12	2.28	5.45	2.15	.....	2.3	2.72
15	6.35	2.9	3.65	4.8	1.78	1.78	2.95	6.48	2.02	.....	2.52	2.6
16	4.3	2.6	5.15	5.7	1.85	1.8	3.08	7.72	2.3	.....	2.42	2.65
17	5.35	2.95	4.65	4.5	1.82	3.1	3.18	10.8	2.3	2.75	2.55	2.75
18	4.45	2.9	3.5	3.58	1.92	3.92	3.7	15.6	2.2	2.8	2.75	2.8
19	4.1	2.7	4.05	3.18	2.05	3.42	4.05	18.5	2.25	4.65	2.8	2.62
20	3.65	2.55	4.0	2.88	1.92	5.78	4.95	17.0	2.48	7.12	3.05	2.52
21	3.05	2.65	5.95	2.68	1.85	4.7	6.75	13.7	3.85	12.75	3.18	2.42
22	3.85	3.5	5.9	2.58	1.98	3.6	10.0	8.9	4.42	8.4	3.2	2.35
23	7.9	2.32	4.05	2.7	1.85	3.9	12.5	7.68	3.9	6.5	2.55	2.22
24	12.3	2.35	3.25	2.58	1.42	3.65	10.3	6.08	3.38	5.05	2.55	2.3
25	8.35	2.5	4.3	2.52	1.8	3.42	8.0	4.85	3.22	4.6	2.35	2.18
26	6.9	2.55	3.8	2.55	2.35	3.35	7.75	4.08	3.15	4.12	2.22	2.12
27	6.0	2.75	4.25	2.42	3.0	6.6	6.65	4.18	2.5	3.9	2.15	2.02
28	8.85	4.12	4.9	2.32	3.5	3.5	7.48	4.18	1.9	3.8	2.1	2.02
29	9.4	.....	4.6	2.88	3.45	2.55	5.35	4.65	2.12	3.85	2.05	2.12
30	7.68	.....	8.3	2.85	1.7	2.42	3.7	4.95	1.98	3.92	1.92	4.75
31	6.3	.....	11.3	.....	1.55	.....	3.4	4.02	.....	3.75	.....	10.7

NOTE.—Discharge probably unaffected by ice.

Rating table for Dan River at South Boston, Va., for 1903–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	1,014	2.40	2,186	3.90	3,400	6.80	6,034
1.00	1,091	2.50	2,265	4.00	3,484	7.00	6,234
1.10	1,168	2.60	2,345	4.20	3,653	8.00	7,275
1.20	1,245	2.70	2,425	4.40	3,824	9.00	8,415
1.30	1,323	2.80	2,505	4.60	3,997	10.00	9,700
1.40	1,401	2.90	2,585	4.80	4,172	11.00	11,100
1.50	1,479	3.00	2,665	5.00	4,349	12.00	12,540
1.60	1,557	3.10	2,746	5.20	4,528	13.00	14,000
1.70	1,635	3.20	2,827	5.40	4,709	14.00	15,500
1.80	1,713	3.30	2,908	5.60	4,892	15.00	17,180
1.90	1,791	3.40	2,989	5.80	5,077	16.00	19,100
2.00	1,870	3.50	3,070	6.00	5,264	17.00	21,650
2.10	1,949	3.60	3,152	6.20	5,453	18.00	24,600
2.20	2,028	3.70	3,234	6.40	5,644	19.00	27,800
2.30	2,107	3.80	3,317	6.60	5,838	20.00	31,200

NOTE.—*The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906 and is fairly well defined. Below gage height 10.4 feet the table is the same as that published for 1904.*

Monthly discharge of Dan River at South Boston, Va., for 1906.

[Drainage area, 2,750 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	30,200	2,700	7,100	2.60	3.00
February	4,040	1,910	2,750	.999	1.04
March	11,500	2,110	3,960	1.44	1.66
April	8,120	2,120	3,320	1.21	1.35
May	3,440	1,420	2,130	.774	.89
June	5,840	1,380	2,650	.963	1.07
July	13,300	1,870	4,250	1.55	1.79
August	26,200	2,730	6,410	2.33	2.69
September	5,220	1,730	2,670	.971	1.08
October	13,600	1,050	3,870	1.41	1.62
November	2,830	1,810	2,270	.825	.92
December	10,700	1,850	2,480	.902	1.04
The year	30,200	1,050	3,660	1.33	18.16

NOTE.—Values for entire year are good.

The following table gives the horsepower (80 per cent efficiency) per foot of fall that may be developed at different rates of discharge, and shows the number of days on which the flow and the corresponding horsepower were respectively less than the amounts given in the columns for "discharge" and "horsepower."

Discharge and horsepower table for Dan River at South Boston, Va., from 1900 to 1906.

Discharge in second-feet.	Horsepower, 80 per cent efficiency, per foot fall.	Number of days of deficient flow.						
		1900.[a]	1901.	1902.	1903.	1904.	1905.	1906.
385	35					1		
440	40					3		
495	45					4		
550	50					6		
660	60					15		
770	70	5				19		
880	80	10				36		
990	90	11		4		46	4	
1,100	100	15		22		57	16	1
1,320	120	27		64	6	89	55	4
1,540	140	47		92	59	165	113	10
1,760	160	64	29	100	112	212	144	29
1,980	180	80	78	112	122	248	172	54
2,200	200	83	129	133	131	275	194	101
2,750	250	111	244	167	161	307	236	175

[a] September 1 to December 31, 1900.

NOTE.—Minimum flow from September 1, 1900, to December 31, 1906, was 375 second-feet, giving 34 horsepower per foot of fall in October, 1904.

CAPE FEAR RIVER DRAINAGE BASIN.

MISCELLANEOUS MEASUREMENT.

The following measurement was made in Cape Fear River drainage basin in 1906:

South Buffalo Creek, near Greensboro, N. C.—A measurement was made June 21, 1906, at the Southern Railway trestle about 2 miles *south of Greensboro*. The bench mark is the top of the upstream

end of the seventh bent cap from the left end of trestle; elevation, 29.50 feet above datum of the assumed gage.

Width, 16 feet; area, 12 square feet; gage height, 1.22 feet; discharge, 7.6 second-feet.

YADKIN, OR PEDEE, RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Yadkin River, called Pedee River, below the junction with the Uharie, rises on the eastern slope of the Blue Ridge, in Caldwell and Watauga counties, N. C., and flows at first southeastward, then turns abruptly to the northeast, and after flowing in this direction for about 60 miles again bends abruptly and flows southward and southeastward across North Carolina and South Carolina, emptying into Winyah Bay at Georgetown, S. C. The total length of the stream from source to mouth, in its general direction, is from 275 to 300 miles, but with all the windings it is probably 400 miles or more.

The Pedee drains a total area of about 17,000 square miles, of which 9,700 square miles are in North Carolina and 7,300 in South Carolina. It crosses the fall line near Cheraw, S. C., in a series of rapids extending over a number of miles, with no very great fall at any one place or in any short distance.

The upper part of the drainage basin is rough and mountainous and is largely forest covered, and throughout this part of its course the flow of the stream is more constant than would be expected. Below the great bend, where the river turns to the south, the valley averages about 50 miles in width. At many points the river is bordered by wide expanses of bottom lands, which are fertile and very productive, but are at times subject to overflow. At other places the stream is confined between bold and abrupt banks, and in one place it flows for several miles in a narrow channel, parts of which are only 60 feet wide, in a deep ravine between the flanking hills, forming the noted "Narrows." Above the great bend the valley is from 15 to 20 miles wide, and the elevations of the divides which separate the basin of the Yadkin from adjacent drainage basins are much higher, so that the tributary streams have a large fall.

Small amounts of power may be developed on some of the tributaries of this river in South Carolina, but the power possibilities of the basin in this State are unimportant. In North Carolina both the main stream and many of its tributaries can be made to furnish power in large amount at a number of places, and for this reason they are among the most important power streams in the Southern States.

The average rainfall over the part of the basin in North Carolina is probably between 48 and 51 inches, approximating the smaller figure over the lower portions, and possibly exceeding the larger over

the higher and more mountainous portions, the precipitation increasing toward the head of the stream. The total amount is rather evenly distributed among the seasons.

What is said to be the highest flood ever known at Wilkesboro occurred in March, 1899, the stream rising 28 feet above low water. The greatest flood recorded at the gaging station at Salisbury occurred in December, 1901, the stream reaching an extreme height on the gage of 19.7 feet and having a probable discharge of about 130,000 second-feet, or about 38 second-feet per square mile. The flood of March, 1899, produced a rise of about 1 foot less than this flood of December, 1901. The most destructive flood ever experienced on the river occurred in May, 1901, but the recorded gage height at the Salisbury station was less for this flood than for either of the others mentioned, and the general testimony of those living along the banks is to the same effect.

The minimum recorded flow at the Salisbury station occurred in September, October, and November, 1897, when the basin experienced the most severe drought in its history. The flow fell to 900 second-feet several times during this period, i. e., the basin above the station was discharging at an average rate of 0.26 second-foot per square mile. The maximum flow is thus about 144 times the minimum.

The United States Weather Bureau maintains river stations on the Pedee at Cheraw and at Smiths Mills, S. C.

YADKIN RIVER NEAR SALISBURY, N. C.

This station was established September 24, 1895. It is located at the Piedmont toll bridge, about 6 miles east of Salisbury, N. C.

The bridge is a five-span steel structure situated 300 yards above the Southern Railway bridge. The channel curves to the right a short distance below the bridge. The bed is rocky. The discharge is modified considerably at times by drift wood lodging against the piers.

Discharge measurements are made from the bridge to which the gage is attached. The gage was first established on the railroad bridge 300 yards below. In 1899 a gage was put on the toll bridge, and this was used until 1903, when the station was moved back to the railroad bridge. In the latter part of 1905 simultaneous readings of the gages on both bridges were commenced and continued during the greater part of 1906. This was to determine the relation between the two gages, as it was finally decided to continue the gage readings from the toll bridge. All 1906 gage heights refer to the toll-bridge gage.

The gage is of the standard chain type, fastened to the downstream lower chord in the second span from the left end. The chain length

.87 feet. The gage is read once each day by J. V. Yarbrough, toll collector. The reference point is the top of the downstream of the first floor beam of the second span from the right bank; ation, 23.14 feet above the gage zero. The bench mark is a lard copper plug set in a rock on right bank on the upstream side e road, 5 feet from the tollgate and 6.4 feet upstream from the eam side of bridge produced; elevation, 31.49 feet above the m of the toll-bridge gage.

Discharge measurements of Yadkin River near Salisbury, N. C., in 1906.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
3.....	E. C. Murphy	462	2,220	2.58	3,430
.....	W. E. Hall	475	2,380	3.10	5,050
ber 11...	do	474	2,440	3.04	4,970

Daily gage height, in feet, of Yadkin River near Salisbury, N. C., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.8	3.55	2.6	4.8	2.75	2.2	2.5	3.95	9.8	3.55	2.9	2.85
.....	2.65	3.35	2.55	3.9	2.8	2.15	2.55	5.3	6.7	3.2	2.9	2.95
.....	2.4	3.2	2.5	3.35	2.85	2.3	2.3	5.7	4.2	3.3	2.85	2.9
.....	8.4	3.0	2.7	3.15	2.85	2.35	2.7	4.1	5.0	4.0	2.95	2.8
.....	9.1	3.0	4.0	3.0	2.95	2.75	4.2	3.45	4.2	4.8	2.9	2.8
.....	5.1	3.0	3.2	2.95	3.0	3.0	2.9	3.15	3.65	4.0	2.8	2.8
.....	3.7	2.9	2.9	2.9	2.85	2.75	2.5	2.9	3.4	3.7	2.8	2.75
.....	3.2	2.8	2.8	2.9	3.55	2.45	2.8	2.8	3.25	3.5	2.8	2.8
.....	3.05	2.8	2.8	2.85	3.05	2.35	3.6	2.75	3.2	3.15	2.75	2.8
.....	2.85	2.85	2.8	2.9	2.65	2.7	4.4	2.65	3.1	3.05	2.75	2.8
.....	2.7	2.8	2.7	3.0	2.5	4.6	3.3	2.55	2.95	3.1	2.9	3.1
.....	3.0	2.7	2.7	2.8	2.4	3.8	2.7	2.55	2.95	2.95	2.85	3.35
.....	4.0	2.6	2.5	2.65	2.55	3.0	2.45	2.55	3.15	2.8	2.75	3.1
.....	3.85	2.6	2.5	2.65	2.55	3.9	2.35	2.65	4.2	3.0	2.75	2.9
.....	3.7	2.65	2.6	2.85	2.35	5.0	2.4	3.6	3.4	2.8	2.75	2.8
.....	3.5	2.55	5.4	3.6	2.3	5.9	2.8	5.4	3.1	2.75	2.85	2.85
.....	3.2	2.5	4.6	3.5	2.35	5.8	4.6	8.2	2.8	2.75	2.85	2.85
.....	3.0	2.6	3.55	3.05	2.25	4.5	3.4	5.6	2.8	2.8	2.85	3.1
.....	2.85	2.65	3.15	2.85	2.25	4.0	3.2	4.8	2.95	3.7	3.0	3.4
.....	2.75	2.5	5.5	2.7	2.35	3.4	3.05	3.8	3.4	9.4	8.5	3.2
.....	2.75	2.45	5.0	2.65	2.4	3.4	3.9	4.0	3.2	7.1	7.2	3.5
.....	2.75	2.9	3.8	2.75	2.2	2.95	6.9	4.0	3.0	4.8	4.1	3.4
.....	4.8	3.0	3.3	2.75	2.2	3.3	6.4	3.85	3.5	4.1	3.65	3.2
.....	9.0	2.9	3.05	2.35	2.2	2.7	5.0	3.55	3.5	3.7	3.35	3.0
.....	5.5	2.7	3.1	2.3	2.2	3.1	3.85	3.25	3.5	3.5	3.25	2.8
.....	4.3	2.7	3.1	2.25	2.15	3.45	5.7	3.15	3.0	3.35	3.2	2.55
.....	4.7	2.5	3.0	2.25	2.35	3.8	4.2	3.25	2.8	3.25	3.05	2.5
.....	7.2	2.55	2.95	2.5	2.8	3.0	5.9	3.65	2.85	3.15	3.05	2.9
.....	6.4	.....	3.05	2.6	2.7	2.7	3.55	4.8	3.15	3.15	3.0	2.95
.....	4.8	.....	3.4	2.65	2.4	2.7	3.35	10.9	3.25	3.0	2.9	3.0
.....	4.0	.....	4.4	.....	2.25	.....	4.2	11.9	.....	3.0	.....	3.15

Rating table for Yadkin River near Salisbury, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	1,990	3.30	5,860	4.60	10,830	6.80	20,950
2.10	2,220	3.40	6,220	4.70	11,240	7.00	22,060
2.20	2,460	3.50	6,580	4.80	11,650	7.20	23,210
2.30	2,720	3.60	6,950	4.90	12,070	7.40	24,400
2.40	2,990	3.70	7,320	5.00	12,490	7.60	25,600
2.50	3,270	3.80	7,700	5.20	13,340	7.80	26,800
2.60	3,560	3.90	8,080	5.40	14,210	8.00	28,000
2.70	3,860	4.00	8,460	5.60	15,090	9.00	34,000
2.80	4,170	4.10	8,850	5.80	15,990	10.00	40,000
2.90	4,490	4.20	9,240	6.00	16,910	11.00	46,000
3.00	4,820	4.30	9,630	6.20	17,860	12.00	52,000
3.10	5,160	4.40	10,030	6.40	18,850		
3.20	5,510	4.50	10,430	6.60	19,880		

NOTE.—The above table is applicable only for open-channel conditions. It is based on measurements made during 1901–1906. It is well defined between gage heights 2 feet and 11 feet. gage height 7.30 feet the rating curve is a tangent, the difference being 60.0 per tenth. Measur made at the railroad bridge have been referred to the toll bridge gage by means of a series of neous readings. This table refers to the toll bridge gage.

Monthly discharge of Yadkin River near Salisbury, N. C., for 1906.

[Drainage area, 3,400 square miles.]

Month.	Discharge in second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
January	34,600	2,990	10,300	3.03
February	6,760	3,130	4,190	1.23
March	14,600	3,270	6,020	1.77
April	11,600	2,590	4,630	1.36
May	6,760	2,340	3,460	1.02
June	16,400	2,340	6,230	1.83
July	21,500	2,720	7,540	2.22
August	51,400	3,420	10,900	3.21
September	38,800	4,170	7,630	2.24
October	36,400	4,010	7,700	2.26
November	31,000	4,010	6,140	1.81
December	6,580	3,270	4,720	1.39
The year	51,400	2,340	6,620	1.95

NOTE.—Values for 1906 are excellent.

YADKIN RIVER AT NORTH WILKESBORO, N. C.

This station was established April 10, 1903. It is located a lower highway bridge between Wilkesboro and North Wilkes about one-half mile below North Wilkesboro railroad station three-fourths mile below the mouth of Reddie River. The condi at this station and the bench marks are described in Water-Su Paper No. 167, page 118, where are given also references to pul tions that contain data for previous years.

Discharge measurements of Yadkin River at North Wilkesboro, N. C., in 190

Date.	Hydrographer.	Width.	Area of section.	Gage height.
		Feet.	*Sq. ft.*	*Feet.*
June 19	W. E. Hall	101	629	3.00
June 19	do	101	619	2.94

Daily gage height, in feet, of Yadkin River at North Wilkesboro, N. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.65	2.35	1.1	2.95	1.15	0.65	1.1	3.7	4.6	3.8	2.45	2.35
2	.65	2.1	1.0	2.35	1.25	1.2	1.0	4.3	3.6	3.7	2.4	2.35
3	4.6	1.75	1.15	2.0	1.15	.75	1.1	3.2	3.1	7.0	2.4	2.3
4	5.8	1.5	4.3	1.8	1.5	.65	2.0	2.6	2.9	7.0	2.35	2.25
5	2.85	1.65	2.5	1.65	1.8	1.4	1.15	2.2	2.9	5.1	2.3	2.2
6	2.0	1.6	1.9	1.6	1.25	3.1	3.0	1.9	2.6	4.3	2.3	2.2
7	1.5	1.45	1.65	1.45	4.8	1.4	1.55	1.9	2.55	3.7	2.2	2.2
8	1.35	1.35	1.6	1.4	1.9	1.05	1.15	1.7	2.4	3.3	2.2	2.1
9	1.2	1.35	1.45	1.35	1.5	1.3	2.4	1.5	2.25	3.0	2.2	2.1
10	.95	1.25	1.3	1.65	1.3	1.4	1.45	1.4	2.1	3.0	2.1	2.1
11	.95	1.2	1.15	1.3	1.2	2.5	1.15	1.5	2.0	2.75	2.1	2.7
12	3.1	1.25	1.15	1.25	1.1	1.2	1.05	1.25	2.0	2.65	2.2	2.2
13	2.2	1.25	1.1	1.2	1.05	2.1	1.05	1.85	2.35	2.6	2.1	2.1
14	3.1	1.2	1.1	1.2	1.0	6.3	.95	2.15	2.15	2.5	2.0	2.1
15	2.6	1.15	2.7	4.2	.9	7.4	2.3	6.2	1.9	2.4	2.15	2.0
16	2.2	1.1	2.8	2.4	.85	5.5	5.0	4.0	1.9	2.4	2.1	2.0
17	1.8	1.0	2.0	1.9	.85	4.7	2.25	3.7	1.85	2.6	2.05	2.1
18	1.6	1.0	1.6	1.65	.8	3.8	2.5	3.7	1.85	2.9	2.85	2.4
19	1.45	1.0	1.65	1.55	.9	3.4	1.9	3.0	3.8	17.9	18.8	2.1
20	1.3	1.0	2.9	1.45	.8	2.6	1.65	2.4	2.9	7.9	7.0	2.5
21	1.2	1.0	2.2	1.4	.75	2.0	1.95	3.5	2.6	4.9	4.6	2.35
22	1.4	1.75	1.9	1.35	.7	2.7	3.0	3.3	2.65	4.1	3.8	2.2
23	12.3	1.15	1.6	1.35	.7	1.7	2.25	3.3	2.9	3.6	3.3	2.15
24	5.0	1.1	1.5	1.2	.7	1.6	2.6	2.4	3.2	3.3	3.0	2.0
25	3.3	1.1	1.5	1.15	.65	2.6	4.4	2.1	2.35	3.15	2.8	1.5
26	2.8	1.1	1.5	1.15	.75	1.7	2.1	2.15	2.15	3.0	2.75	1.7
27	3.3	1.1	1.5	1.15	1.95	1.4	2.6	2.35	2.75	2.9	2.55	1.9
28	4.0	1.15	1.5	1.15	1.3	1.25	2.3	3.4	3.0	2.75	2.65	1.9
29	3.6	.....	1.45	1.05	.9	1.25	1.75	18.0	6.6	2.65	2.45	2.1
30	2.9	.....	4.6	1.6	.75	1.25	2.95	9.2	4.4	2.6	2.35	2.0
31	2.6	.....	4.3	.....	.7	.....	2.35	7.2	.....	2.55	.....	7.6

Rating table for Yadkin River at North Wilkesboro, N. C., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
−0.60	215	0.80	745	2.40	1,725	6.00	5,100
−.50	245	.90	790	2.60	1,880	7.00	6,100
−.40	275	1.00	840	2.80	2,045	8.00	7,100
−.30	305	1.10	800	3.00	2,220	9.00	8,100
−.20	340	1.20	945	3.20	2,400	10.00	9,100
−.10	375	1.30	1,000	3.40	2,580	11.00	10,100
.00	410	1.40	1,055	3.60	2,760	12.00	11,100
.10	450	1.50	1,115	3.80	2,950	13.00	12,100
.20	490	1.60	1,175	4.00	3,140	14.00	13,100
.30	530	1.70	1,240	4.20	3,330	15.00	14,100
.40	570	1.80	1,305	4.40	3,520	16.00	15,100
.50	610	1.90	1,370	4.60	3,710	17.00	16,100
.60	655	2.00	1,440	4.80	3,900	18.00	17,100
.70	700	2.20	1,580	5.00	4,100	19.00	18,100

OTE.—The above table is applicable only for open-channel conditions. It is based on discharge asurements made during 1903–1906. Owing to changing conditions of flow, it can not be considered ery well defined. Above gage height 4.8 feet, the rating curve is a tangent, the difference being per tenth.

Monthly discharge of Yadkin River at North Wilkesboro, N. C., for 1905–6.

[Drainage area, 500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
January	3,330	215	730	1.44	1.66
February	2,960	340	929	1.86	1.94
March	1,960	570	740	1.48	1.71
April	2,950	530	772	1.54	1.72
May	3,240	510	1,010	2.02	2.33
June	1,720	410	585	1.17	1.30
July	11,600	530	1,680	3.36	3.87
August	3,420	530	1,200	2.40	2.77
September	6,000	410	819	1.64	1.83
October	2,950	410	608	1.22	1.41
November	510	450	485	.970	1.08
December	7,200	570	1,290	2.58	2.97
The year	11,600	215	903	1.81	24.30
1906.					
January	11,400	677	2,160	4.32	4.98
February	1,690	840	1,020	2.04	2.12
March	3,710	840	1,460	2.92	3.37
April	3,330	865	1,230	2.46	2.74
May	3,900	677	986	1.97	2.27
June	6,500	677	1,840	3.68	4.11
July	4,100	815	1,550	3.10	3.57
August	17,100	972	2,900	5.80	6.69
September	5,700	1,340	2,110	4.22	4.71
October	17,000	1,720	3,270	6.54	7.54
November	17,900	1,440	2,520	5.04	5.62
December	6,700	1,120	1,710	3.42	3.94
The year	17,900	677	1,900	3.79	51.66

NOTE. Values are rated as follows: 1905 and 1906, fair; discharge above 4,000 second-feet, approximate.

MISCELLANEOUS MEASUREMENTS IN YADKIN RIVER DRAINAGE BASIN.

The following miscellaneous discharge measurements were made in Yadkin River drainage basin in North Carolina in 1906:

Date.	Stream.	Locality.	Width.	Area of section.	Gage height.	Discharge.
			Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 19	Reddie	North Wilkesboro	70	134	2.60	70
June 21	Mayo	Madison	80	410	2.82	95

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[Water-Supply Paper No. 203.]

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1888. Tenth Annual Report, Part II.*
1889. Eleventh Annual Report, Part II.*
1890. Twelfth Annual Report, Part II.*
1891. Thirteenth Annual Report, Part III.*
1892. Fourteenth Annual Report, Part II.*
1893. Bulletin No. 131.*
1894. Bulletin No. 131;* Sixteenth Annual Report, Part II.*
1895. Bulletin No. 140.*
1896. Water-Supply Paper No. 11;* Eighteenth Annual Report, Part IV.*
1897. Water-Supply Papers Nos. 15* and 16;* Nineteenth Annual Report, Part IV.*
1898. Water-Supply Papers Nos. 27* and 28;* Twentieth Annual Report, Part IV.*
1899. Water-Supply Papers Nos. 35,* 36,* 37,* 38,* and 39;* Twenty-first Annual Report, Part IV.*
1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.
1901. East of Mississippi River, Water-Supply Papers Nos. 65* and 75.*
West of Mississippi River, Water-Supply Papers Nos. 66 and 75.*

1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.
1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.
1905. East of Mississippi River, Water-Supply Papers Nos. 165,* 166,* 167, 168,* 169, 170, and 171.
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1906. East of Mississippi River, Water-Supply Papers Nos. 201, 202, 203, 204, 205, 206, and 207.
West of Mississippi River, Water-Supply Papers Nos. 207, 208, 209, 210, 211, 212, 213, and 21

Correspondence should be addressed to

THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

JULY, 1907.

O

ply and Irrigation Paper No. 204 Series P, Hydrographic Progress Reports, 58

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY
OF
THERN ATLANTIC AND EASTERN GULF STATES, 1906

STEE, SAVANNAH, OGEECHEE, AND ALTAMAHA RIVERS
AND EASTERN GULF OF MEXICO DRAINAGES)

M. R. HALL
DISTRICT HYDROGRAPHER

WASHINGTON
GOVERNMENT PRINTING OFFICE

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WEST VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
400 500 miles
C. J. Peters & Son Co., Engrs., Boston.
37°
35°
33°
31°
29°
27°
25°
87°
85°
83°
81°
79°
77°

. URING 1906.

estimates of future flow can be made only from a study of obs tions covering several years. The rapid increase in the develop of the water resources of the United States has caused a great de by engineers for information in regard to the flow of streams, a now generally realized that the failure of many large power, i tion, and other projects has been due to the fact that the plans made without sufficient trustworthy information in respect t water supply.

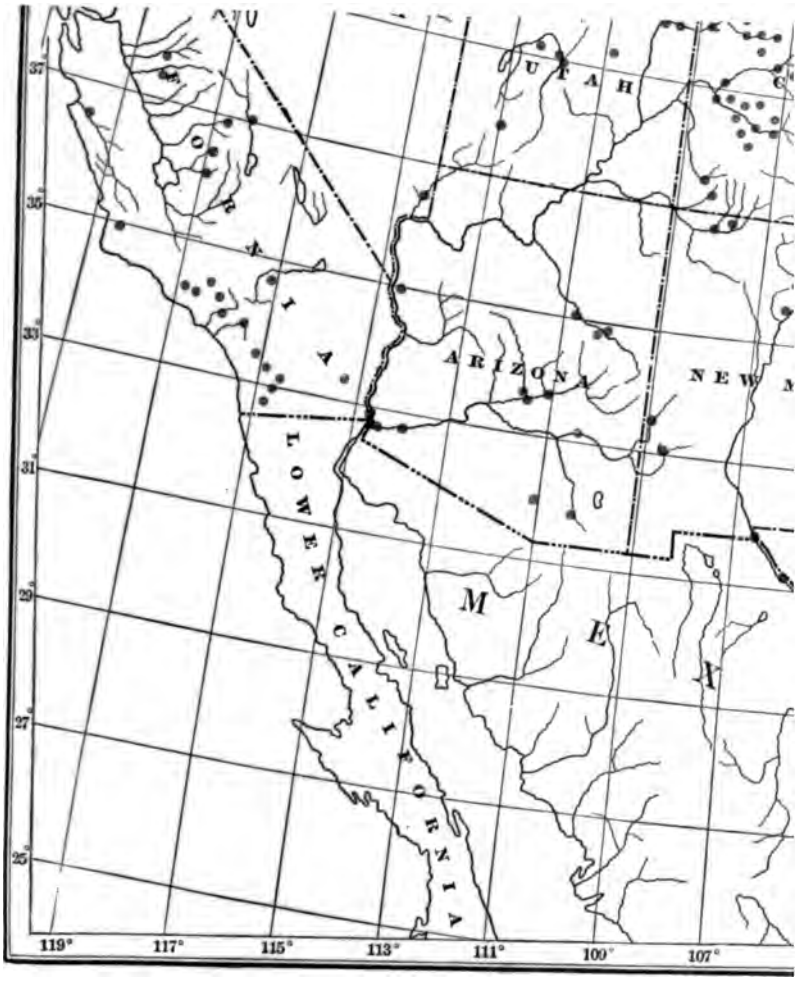
Owing to the broad scope of these hydrographic investigation the length of time they should cover in order that the records be of greatest value, it is in general impossible for private indivi to collect the necessary data, and as many of the streams tra more than one State this work does not properly fall withi province of the State authorities. The United States Geol Survey has therefore, by means of specific appropriations by gress, for several years systematically made records of stream with the view of ultimately determining all the important fea governing the flow of the principal streams of the country. I rying out this plan stations are established on the streams and tained for a period long enough to show their regimen or ge behavior. When a record that is sufficient for this purpose has obtained for any stream the work on that stream is disconti The order in which the streams are measured is determined b degree of their importance.

During 1906 the regimen of flow was studied at about 700 st distributed along the various rivers throughout the United Stat shown on Pl. I. In addition to these records data in regard t cipitation, evaporation, water power, and river profiles were obt in many sections of the country.

These data have been assembled by drainage areas, and are lished in a series of fourteen Water-Supply and Irrigation P Nos. 201 to 214, inclusive, each of which pertains to the surface resources of a group of adjacent areas. In these papers are emb not only the data collected in the field, but also the results of putations based on these data, and other information that direct bearing on the subject, such as descriptions of basins an streams draining them, utility of the water resources, etc. Th follows:

Water-Supply and Irrigation Papers on Surface Water Supply, 1906.

201. Surface water supply of New England, 1906 (Atlantic coast of New E drainage).
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river ages, 1906.



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204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers and eastern Gulf of Mexico drainages.)
205. Surface water supply of the Ohio and lower eastern Mississippi river drainages, 1906.
206. Surface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
207. Surface water supply of the upper Mississippi River and Hudson Bay drainages, 1906.
208. Surface water supply of the Missouri River drainage, 1906.
209. Surface water supply of the lower western Mississippi River drainage, 1906.
210. Surface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
211. Surface water supply of the Colorado River drainage above Yuma, 1906.
212. Surface water supply of the Great Basin drainage, 1906.
213. Surface water supply of California, 1906. (The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage below Yuma.)
214. Surface water supply of the North Pacific Coast drainage, 1906.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing such records up to and including 1903 has been published in Water-Supply Paper No. 119. The following table gives, by years and primary drainage basins, the numbers of the papers on surface water supply published from 1901 to 1906:

Numbers of Water-Supply Papers containing results of stream measurements, 1901–1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
Atlantic coast of New England drainage	65 75	82	97	124	165	201
Hudson, Passaic, Raritan, and Delaware rivers drainages	65 75	82	97	125	166	202
Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages	65 75	82 83	97 98	126	167	203
Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages	65 75	83	98	127	168	204
Ohio and lower eastern Mississippi river drainages	65 75	83	98	128	169	205
Great Lakes and St. Lawrence River drainages	65	83	97	129	170	206
Hudson Bay and upper eastern and western Mississippi River drainages	65 66 75	83 84 85	98 99 100	128 130	171	207
Missouri River drainage	66 75	84	99	130 131	172	208
Meramec, Arkansas, Red, and lower western Mississippi river drainages	66 75	84	99	131	173	209
Western Gulf of Mexico and Rio Grande drainages	66 75	84	99	132	174	210
Colorado River drainage above Yuma	66 75	85	100	133	175	211
The Great Basin drainage	66 75	85	100	133	176	212
The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage below Yuma	66 75	85	100	134	177	213
North Pacific Coast drainage	66 75	85	100	135	178	214

[a] Reports containing data for years prior to 1901 are noted in the series list at the end of this paper.

DEFINITIONS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and run-off in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West, and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot: One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. *Table of* monthly and yearly discharges and run-off.

Tables showing discharge and horsepower and the number of during the year when the same are available.

e descriptions of stations give such general information about the ity and equipment as would enable the reader to find and use the on, and they also give, as far as possible, a complete history of all hanges that have occurred since the establishment of the station would be factors in using the data collected.

e discharge-measurement table gives the results of the discharge urements made during the year, including the date, the name of ydrographer, the width and area of cross section, the gage height, he discharge in second-feet.

e table of daily gage heights gives the daily fluctuations of the ce of the river as found from the mean of the gage readings taken day. The gage height given in the table represents the elevation e surface of the water above the zero of the gage. At most sta- the gage is read in the morning and in the evening.

e discharge measurements and gage heights are the base data which the other tables are computed. In cases of extensive lopment it is expected that engineers will use these original data aking their calculations, as the computations made by the Sur- are based on the data available at the time they are made and ld be reviewed and, if necessary, revised when additional data are able.

e rating table gives the discharge in second-feet corresponding to us stages of the river as given by the gage heights. It is pub- l to enable engineers to determine the daily discharge in case this mation is desired.

the table of monthly discharge the column headed "Maximum" the mean flow for the day when the mean gage height was high- nd it is the flow as given in the rating table for that mean gage t. As the gage height is the mean for the day, there might have short periods when the water was higher and the corresponding arge larger than given in this column. Likewise in the column Minimum" the quantity given is the mean flow for the day when nean gage height was lowest. The column headed "Mean" is verage flow for each second during the month. Upon this the utations for the remaining columns, which are defined on page 4, ased.

e values in the table of monthly discharge are intended to give a general idea of the conditions of flow at the station, and it is not cted that they will be used for other than preliminary estimates. most work where data in regard to flow are used the regimen of is of primary importance. Therefore for the principal stations s have been prepared showing the horsepower that can be

developed at various rates of flow, and the length of time that these rates of flow and the corresponding horsepower are available. These tables have been prepared on a basis of 80 per cent efficiency on the turbines, and the horsepower per foot of fall is given in order that the reader can determine the horsepower for any fall.

In the computations, sufficient significant figures have been used so that the percentage of error in the tables will not in general exceed 1 per cent. Therefore, most of the values in the tables are given to only three significant figures. In making the various computations, Thatcher's slide rule, Crelle's tables, and computation machines have been generally used.

In order to give engineers an idea of the relative value of the various data, notes in regard to accuracy are given as far as possible. This accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data.

In the accuracy notes the following terms have been used, indicating the probable accuracy, in per cent, of the mean monthly flow. As these values are mean values, the error in the value for the flow of any individual day may be much larger.

Excellent indicates that the mean monthly flow is probably accurate to within 5 per cent; good, to within 10 per cent; fair, to within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet, or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile .03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.

second-foot for one 30-day month equals 59.50 acre-feet.
second-foot for one 31-day month equals 61.49 acre-feet.
)0 California miner's inches equal 15.7 United States gallons per second.
)0 California miner's inches equal 96.0 Colorado miner's inches.
)0 California miner's inches for one day equal 4.96 acre-feet.
)0 Colorado miner's inches equal 2.60 second-feet.
0 Colorado miner's inches equal 19.5 United States gallons per second.
0 Colorado miner's inches equal 104 California miner's inches.
0 Colorado miner's inches for one day equal 5.17 acre-feet.
0 United States gallons per minute equal 0.223 second-foot.
0 United States gallons per minute for one day equal 0.442 acre-foot.
000,000 United States gallons per day equal 1.55 second-feet.
000,000 United States gallons equal 3.07 acre-feet.
000,000 cubic feet equal 22.95 acre-feet.
acre-foot equals 325,850 gallons.
inch deep on 1 square mile equals 2,323,200 cubic feet.
inch deep on 1 square mile equals 0.0737 second-foot per year.
foot equals 0.3048 meter.
mile equals 1.60935 kilometers.
mile equals 5,280 feet.
acre equals 0.4047 hectare.
acre equals 43,560 square feet.
acre equals 209 feet square, nearly.
square mile equals 2.59 square kilometers.
cubic foot equals 0.0283 cubic meter.
cubic foot equals 7.48 gallons.
cubic foot of water weighs 62.5 pounds.
cubic meter per minute equals 0.5886 second-foot.
horsepower equals 550 foot-pounds per second.
horsepower equals 76.0 kilogram-meters per second.
horsepower equals 746 watts.
horsepower equals 1 second-foot falling 8.80 feet.
horsepower equal about 1 kilowatt.
To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water-
eel, realizing 80 per cent of theoretical power.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them publication are given in detail in Water-Supply Papers No. 94 ydrographic Manual, U. S Geological Survey) and No. 95 (Accuracy Stream Measurements). In order that those who use this report y readily become acquainted with the general methods employed, following brief descriptions are given:

Streams may be divided, with respect to their physical conditions, o three classes: (1) Those with permanent beds; (2) those with ls which change only during extreme low or high water; (3) those h constantly shifting beds. In determining the daily flow, special thods are necessary for each class. The data upon which these

determinations are based and the method of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir; (3) by measurements of the velocity of the current and the area of the cross section. The method chosen for any case depends upon the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v=c\sqrt{Rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The results obtained by the slope method are, in general, only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the values for n to be used in Kutter's formula. The most common use of this method is in estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir method.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining the flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable measurements of flow. The conditions necessary to insure good results may be divided into two classes—(1) those relating to the physical characteristics of the dam itself, and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q=c\,b\,h^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Papers Nos. 180 and 200[a]); (*f*) either no flashboards or exceptional care in reducing leakage through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, the dam is built for purposes of power or navigation, and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such determinations of

[a] *Water-Supply Paper* No. 200 replaces No. 150, the edition of which has been exhausted.

low, the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured, either by a weir, a current meter, or a simple system of water wheels which are of standard make or which have been rated as meters under working conditions and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the determinations of flow will not involve, for a critical stage of considerable duration, the use of a head on a broad-crested dam of less than 6 inches. Moreover, when all other conditions are good the cooperation of the owners or operators of the plant is still essential if reliable results are to be obtained.

A gaging station at a weir or dam has the general advantage of continuity of record through the period of ice and floods and the disadvantages of uncertainty of coefficient to be used in the weir formula and of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water flowing past a certain section of a stream at a given time is termed a discharge measurement. This quantity is the product of two factors—the mean velocity and the area of the cross section. The mean velocity is a function of surface slope, wetted perimeter, roughness of bed, and the channel conditions at, above, and below the gaging section. The area depends on the contour of the bed and the fluctuations of the water surface. The two principal ways of measuring the velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging stations for determining discharge by velocity measurements, in order that the data may have the required degree of accuracy. Their essential requirements are practically the same, whether the velocity is determined by meters or floats. They are located as far as possible where the channel is straight both above and below the gaging section; where there are no cross currents, backwater, or boils; where the bed of the stream is reasonably free from large projections of a permanent character, and where the banks are high and subject to overflow only at flood stages. The station must be so far removed from the effects of tributary streams and of dams or other artificial obstructions that the gage height shall be an index of the discharge.

Certain permanent or semipermanent structures, usually referred to as equipment, are generally pertinent to a gaging station. These are a gage for determining the fluctuations of the water surface, bench marks to which the datum of the gage is referred, permanent marks on a bridge or a tagged line indicating the points of measurement, and where the current is swift some appliance (generally a secondary

cable) to hold the meter in position in the water. As a rule the stations are located at bridges if the channel conditions are satisfactory, as from them the observations can more readily be made and the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In case of flood measurements good results can be obtained by observing the velocity of floating cakes of ice or débris. In case of all surface-float measurements coefficients must be used to reduce the observed velocity to the mean velocity. The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

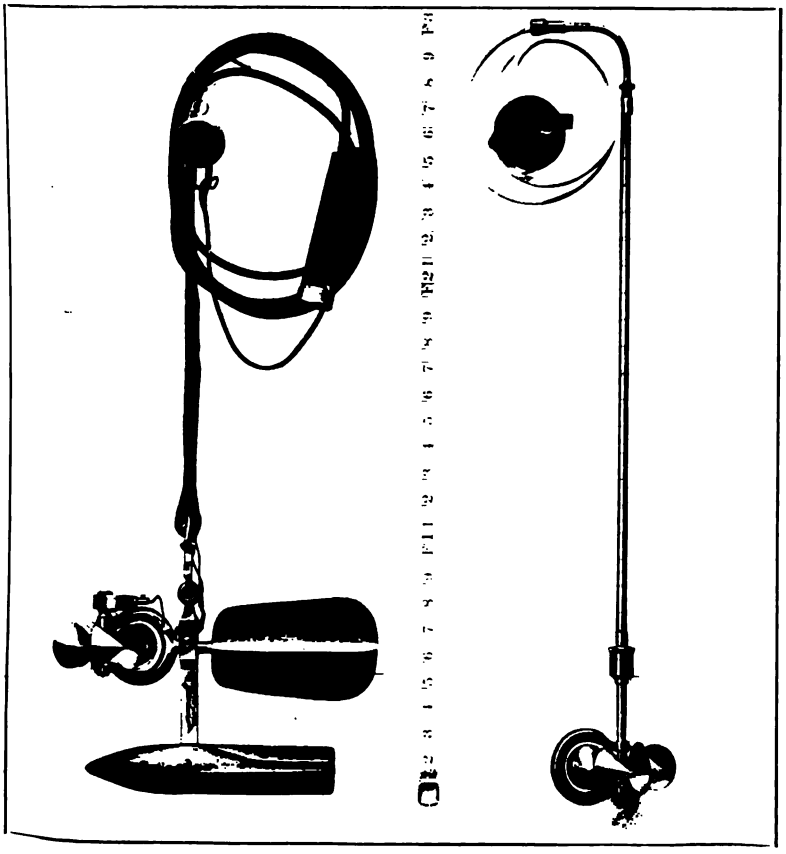
In measuring velocity by a float, observation is made of the time taken by the float to pass over the "run," a selected stretch of river from 50 to 200 feet long. In each discharge measurement a large number of velocity determinations are made at different points across the stream, and from these observations the mean velocity for the whole section is determined. This may be done by plotting the mean positions of the floats, as indicated by the distances from the bank, as ordinates, and the corresponding times as abscissas. A curve through these points shows the mean time of run at any point across the stream, and the mean time for the whole stream is obtained by dividing the area bounded by this curve and its axis by the width. The length of the run divided by the mean time gives the mean velocity.

The area used in float measurements is the mean of the areas at the two ends of the run and at several intermediate sections.

The essential parts of the current meters in use are a wheel of some type, so constructed that the impact of flowing water causes it to revolve, and a device for recording or indicating the number of revolutions. The relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter. The rating is done by drawing the meter through still water for a given distance at different speeds, and noting the number of revolutions for each run. From these data a rating table is prepared which gives the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They may, however, be classed in two general types: Those in which the wheel is made up of a series of cups, as the Price, and those having a screw propeller wheel, as the Haskell. Each meter has been developed for use under some special condition. In the case of the small Price meter, shown in Pl. II, *B*, which has been largely developed and extensively used by the United States Geological Survey, an attempt

A. CURRENT-METER RATING STATION AT LOS ANGELES, CAL.



B. PRICE CURRENT METERS.

has been made to get an instrument which could be used under practically all conditions.

Current-meter measurements may be made from a bridge, a cable, a boat, or by wading, and gaging stations may be classified in accordance with such use. Fig. 1 shows a typical cable station.

In making the measurement an arbitrary number of points are laid off on a line perpendicular to the thread of the stream. The points at which the velocity and depth are observed are known as measuring points, and are usually fixed at regular intervals, varying from 2 to 20 feet, depending upon the size and condition of the stream. Perpendiculars dropped from the measuring points divide the gaging section into strips. For each strip or pair of strips the mean velocity, area, and discharge are determined independently, so that conditions existing in one part of the stream may not be extended to parts where they do not apply.

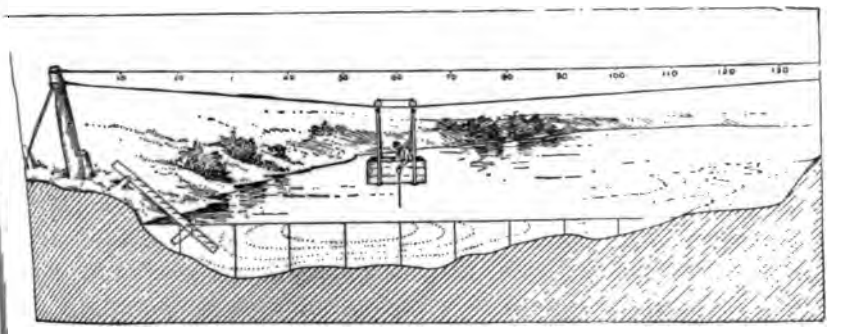


FIG. 1.—Cable station, showing section of river, car, gage, etc.

Three classes of methods of measuring velocity with current meters are in general use—multiple-point, single-point, and integration.

The three principal multiple-point methods in general use are the vertical velocity-curve; 0.2 and 0.8 depth; and top, bottom, and mid-depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually from 0.5 to 1 foot apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve among the resulting points, the vertical velocity-curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the area bounded by this velocity-curve and its axis by the depth. On account of the length of time required to make a complete measurement by this method its use is limited to the determination of coefficients for purposes of comparison and to measurements under ice.

In the second multiple-point method the meter is held successi at 0.2 and 0.8 of the depth, and the mean of the velocities at these points is taken as the mean velocity for that vertical. On the assu tion that the vertical velocity-curve is a common parabola with h zontal axis, the mean of the velocities at 0.22 and 0.79 of the de will give (closely) the mean velocity in the vertical. Actual obse tions under a wide range of conditions show that this second multi point method gives the mean velocity very closely for open-wa conditions, and moreover the indications are that it holds nearly well for ice-covered rivers.

In the third multiple-point method the meter is held at mid-dep at 0.5 foot below the surface, and at 0.5 foot above the bottom, a the mean velocity is determined by dividing by 6 the sum of the t velocity, 4 times the mid-depth velocity, and the bottom veloci This method may be modified by observing at 0.2, 0.6, and 0.8 dep

The single-point method consists in holding the meter either at t depth of the thread of mean velocity or at an arbitrary depth which the coefficient for reducing to mean velocity has been det mined.

Extensive experiments by vertical velocity-curves show that t thread of mean velocity generally occurs at from 0.5 to 0.7 of the to depth. In general practice the thread of mean velocity is conside to be at 0.6 depth, at which point the meter is held in a majority of t measurements. A large number of vertical velocity-curve measu ments, taken on many streams and under varying conditions, sh that the average coefficient for reducing the velocity obtained at depth to mean velocity is practically unity.

In the other principal single-point method the meter is held n the surface, usually 1 foot below, or low enough to be out of the eff of the wind or other disturbing influences. This is known as the s surface method. The coefficient for reducing the velocity taken the subsurface to the mean has been found to be from 0.85 to 0. depending upon the stage, velocity, and channel conditions. T higher the stage the larger the coefficient. This method is speci adapted for flood measurements or when the velocity is so great t the meter can not be kept at 0.6 depth.

The vertical-integration method consists in moving the meter a slow, uniform speed from the surface to the bottom and back agai the surface and noting the number of revolutions and the time ta in the operation. This method has the advantage that the veloc at each point of the vertical is measured twice. It is useful as a ch on the point methods.

The area, which is the other factor in the velocity method of de mining the discharge of a stream, depends on the stage of the ri

which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at various points of measurement the measuring section is divided into elementary strips, as shown in fig. 1, and the mean velocity, area, and discharge are determined separately for either a single or a double strip. The total discharge and the area are the sums of those for the various strips, and the mean velocity is obtained by dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, owing to diversity and instability of conditions during the winter period and also to lack of definite information in regard to the laws of flow of water under ice. The method now employed is to make frequent discharge measurements during the frozen periods by the 0.2 and 0.8, and vertical velocity-curve methods, and to keep an accurate record of the conditions, such as the gage height to the surface of the water as it rises in a hole cut in the ice, the thickness and character of the ice, etc. From these data an approximate estimate of the daily flow can be made by constructing a rating curve (really a series of curves) similar to that used for open channels, but considering, in addition to gage heights and discharge, the varying thickness of ice. For information in regard to flow under ice cover see Water-Supply Paper No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of determining run-off, depending upon whether or not the bed of the stream is permanent.

For stations of streams with permanent beds the first step in computing the run-off is the construction of a rating table, which shows the discharge corresponding to any stage of the stream. This rating table is applied to the record of stage to determine the amount of water flowing. The construction of the rating table depends upon the method used in measuring flow.

For a station at a weir or dam the basis for the rating table is some standard weir formula. The coefficients to be used in its application

depend upon the type of dam and other conditions near its cr After inserting in the weir formula the measured length of crest a assumed coefficient the discharge is computed for various heads a the rating table constructed.

The data necessary for the construction of a rating table fo velocity-area station are the results of the discharge measuremei which include the record of stage of the river at the time of measu ment, the area of the cross section, the mean velocity of the curre and the quantity of water flowing. A thorough knowledge of conditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends upon the follow laws of flow for open permanent channels: (1) The discharge v remain constant so long as conditions at or near the gaging stat remain constant. (2) The discharge will be the same whenever stream is at a given stage if the change of slope due to the rise a fall of the stream be neglected. (3) The discharge is a function and increases gradually with the stage.

The plotting of results of the various discharge measurements, us gage heights as ordinates, and discharge, mean velocity, and area abscissas, will define curves which show the discharge, mean veloci and area corresponding to any gage height. For the development these curves there should be, therefore, a sufficient number of discha measurements to cover the range of the stage of the stream. Fig shows a typical rating curve with its corresponding mean-velocity a area curves.

As the discharge is the product of two factors, the area and t mean velocity, any change in either factor will produce a correspo ing change in the discharge. Their curves are therefore construct in order to study each independently of the other.

The area curve can be definitely determined from accurate sou ings extending to the limits of high water. It is always conca toward the horizontal axis or on a straight line, unless the banks the stream are overhanging.

The form of the mean-velocity curve depends chiefly upon the s face slope, the roughness of the bed, and the cross section of t stream. Of these the slope is the principal factor. In accorda with the relative changes of these factors the curve may be eithe straight line, convex or concave toward either axis, or a combinat of the three. From a careful study of the conditions at any gag station the form which the vertical velocity-curve will take can predicted, and it may be extended with reasonable certainty to sta beyond the limits of actual measurements. Its principal use is connection with the area curve in locating errors in discharge me urements and in constructing the rating table.

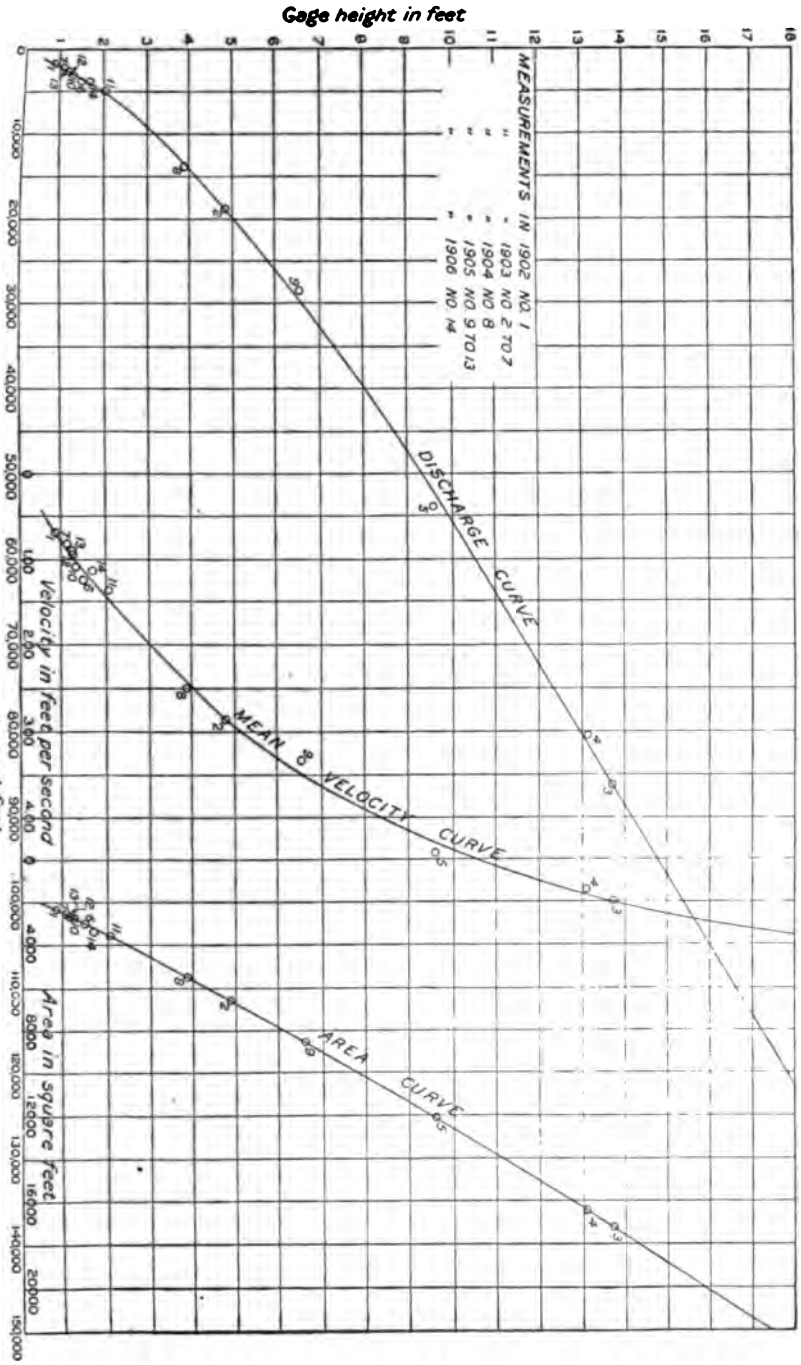


FIG. 2.—Discharge, area, and mean-velocity curves for Potomac River at Point of Rocks, Md.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the determinations of flow are to be other than rough approximations. For stations with beds which shift slowly, or are materially changed only during floods, rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days and the discharge for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report of the United States Geological Survey, Part IV, p. 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in determining the flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Assistance has been rendered on records furnished by the following, to whom special acknowledgment is due:

Officers and employees of the United States Weather Bureau; The Pea River Power Company; J. M. Youngblood; Southern Railway; Georgia Railroad; Louisville and Nashville Railroad; Macon, Dublin and Savannah Railroad; Illinois Central Railroad; Atlanta and West Point Railroad; Seaboard Air Line Railway.

SOUTHERN ATLANTIC STATES DRAINAGES.

SANTEE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

ntee River, which is formed in the central part of South Carolina he junction of Congaree and Wateree rivers, flows southeast- and enters the Atlantic Ocean about 10 miles north of Cape ain. It has a total length of about 180 miles (following the e of the river) and drains an area of about 15,000 square miles. a navigable stream for its entire length and of course offers no tunities for the development of power.

teree River, the more northerly of the two parent streams, rises e eastern slope of the Blue Ridge, in McDowell County, N. C., ows northeastward and then eastward, then bends abruptly to utheast and flows in this general direction across the south cen- art of North Carolina and the north central part of South Caro- o its junction with the Congaree, practically paralleling Yadkin 'edee rivers. Throughout its course in North Carolina, and also gh that part of its course in South Carolina above the mouth of ree Creek it is known as Catawba River. The total length of the m is about 270 miles in a straight line and about 450 miles when e windings are followed.

e Wateree is navigable as far as Camden, but above that point the so great that navigation is impracticable. In 1826 and follow- ears the State of South Carolina spent large sums in the attempt nder the river navigable by means of locks and dams. Some and important works were constructed at great expense, but the rtaking was abandoned before their completion. Linville and rivers are the principal tributaries in North Carolina.

teree River crosses the fall line about 5 miles above Camden, in rapids about 5 miles in length, with a total fall of about 52 The great falls of the Catawba are some distance above. This largest power in South Carolina and one of the largest in the ern States, the available fall being 173 feet.

e average rainfall in the basin is about 50 inches, the annual total asing as the stream is ascended. The greatest recorded flood e river was in May, 1901, the gage reading at the Rockhill n being 24.15 feet and the measured discharge nearly 151,000 d-feet, or nearly 50 second-feet per square mile from the drainage above the station. The greatest flood previously experienced e stream was in 1865. This was only 2 feet lower than the flood y, 1901, on the lower part of the river, but the latter rise exceeded evious records on the upper part of the river by from 8 to 15 feet. minimum flow recorded for the Rockhill station is 1,300 second-

feet, or about 0.43 second-foot per square mile. This occurred in September, 1895 and 1896. The maximum flow is about 116 times the minimum. During 1904 the minimum flow was 810 second-feet at the Catawba station. This was due to the storing of water at the new dam near Rockhill.

The Congaree, the second and more southerly of the two streams which by their union form the Santee, is formed by the junction of Broad and Saluda rivers between Lexington and Richland counties, S. C., whence it flows in a general southeasterly direction, but in a very tortuous channel, for about 60 miles to its junction with the Wateree. The stream is navigable to Columbia, the capital of the State. There it crosses the fall line, giving rise to a very fine water power, the only one on the stream, which is being extensively used in the manufacturing enterprises of Columbia.

Broad River rises on the eastern slope of the Blue Ridge near Hickory Nut Gap, in the southwestern part of McDowell County and the northeastern part of Henderson County, N. C., and flows in a general southeasterly direction across a portion of south-central North Carolina and north-central South Carolina to its junction with the Saluda at Columbia. The length of the river in a straight line is about 125 miles, but is much greater if the course of the river is followed.

The rainfall of the basin averages about 51 inches, of which about 13 inches fall in spring, the same in summer, about 10 in autumn, and about 15 in winter. It is probable that the precipitation in the region about the headwaters is much greater than these amounts indicate.

The maximum flood recorded at the Alston station on this stream 25 miles above Columbia, occurred in May, 1901, the estimated discharge being 131,000 second-feet, equivalent to about 28 second-feet per square mile. The minimum flow recorded at the same place 1,250 second-feet, equivalent to 0.27 second-foot per square mile. This occurred during October, 1904. The maximum flow is therefore about 105 times the minimum.

Saluda River is formed in western South Carolina by the junction of North, South, and Middle forks and flows southeastward to its junction with Broad River, the length of the stream being about 110 miles in a straight line. The three forks are mountain streams, and the character of the drainage basin is similar to that of Broad River.

The average rainfall over the basin of the stream is 51 inches, the amount and seasonal distribution being similar to that on the Broad. The maximum flood recorded at the Waterloo station on this stream occurred in February, 1902, the rise being 23 feet above low water and the estimated discharge being about 18,500 second-feet, equivalent to about 18 second-feet per square mile. The minimum discharge so far recorded is 200 second-feet, or about 0.19 second-foot per square mile. This occurred during October, 1904. The maximum discharge about 108 times the minimum.

CATAWBA RIVER NEAR MORGANTON, N. C.

The original station was established, in connection with the hydro-phic investigation of the southern Apalachian area, on June 19, 0, at which time a wire gage was installed on the highway bridge the road from Morganton to Hartland. In May, 1901, the river oughout this part of its course rose from 8 to 15 feet higher than r before known and the bridge and gage were destroyed. The sent station was established May 15, 1903, at the bridge which was lt to replace the one carried away by the flood of May, 1901. The tion is 1 mile north of Morganton and about 200 yards below the uth of Upper Creek. The conditions at this station and the bench rks are described in Water-Supply Paper No. 168, page 21, where given also references to publications that contain data for previous ars.

Discharge measurements of Catawba River near Morganton, N. C., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height	Discharge
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 2	Murphy and Hall	160	700	1.84	1,240
June 18	W. E. Hall	216	1,220	4.6	4,640

Daily gage height, in feet, of Catawba River near Morganton, N. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1.65	3.3	1.9	3.1	2.15	1.5	17	2.35	2.05	2.6	2.8	1.7	4.0
2	1.65	2.8	1.85	2.8	2.05	1.45	18	2.15	2.0	2.1	2.6	1.6	3.55
3	3.4	2.7	1.85	2.4	2.05	1.4	19	2.15	2.0	2.85	2.5	1.6	2.85
4	5.6	2.6	2.05	2.25	2.0	2.75	20	2.0	1.95	2.8	2.35	1.55	3.3
5	2.8	2.6	2.35	2.15	2.3	2.2	21	1.9	2.1	2.5	2.2	1.55	2.7
6	2.45	2.5	2.25	2.2	2.05	1.95	22	2.3	2.0	2.35	2.15	1.5	3.45
7	2.3	2.3	2.1	2.2	2.05	1.7	23	13.1	2.2	2.35	2.1	1.6	3.0
8	2.2	2.25	2.3	2.1	2.0	1.65	24	5.4	2.2	2.2	2.1	1.55	2.1
9	2.0	2.2	2.2	2.0	1.9	1.6	25	4.0	2.1	2.05	1.95	1.45	2.05
10	1.85	2.1	2.1	1.95	1.9	2.4	26	3.8	2.1	2.0	1.9	1.6	2.05
11	2.9	2.05	1.95	1.9	1.85	2.1	27	4.0	2.05	1.9	1.8	2.05	1.9
12	3.3	2.2	1.9	1.9	1.7	2.5	28	3.9	1.95	1.9	1.8	1.7	1.85
13	2.6	2.2	1.8	1.8	1.9	3.15	29	3.8		1.8	1.85	1.65	1.85
14	2.05	2.15	1.95	2.6	1.95	6.4	30	3.05		4.3	1.9	1.65	1.8
15	3.15	2.15	4.2	2.0	1.8	9.8	31	3.5		3.3		1.55	
16	2.8	2.15	3.15	2.9	1.75	5.2							

NOTE.—Gage reading not taken during last six months.

Rating table for Catawba River near Morganton, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	740	2.60	2,160	3.80	3,800	6.00	7,700
1.50	840	2.70	2,290	3.90	3,950	7.00	9,800
1.60	950	2.80	2,420	4.00	4,100	8.00	12,000
1.70	1,060	2.90	2,550	4.20	4,400	9.00	14,300
1.80	1,180	3.00	2,680	4.40	4,710	10.00	16,600
1.90	1,300	3.10	2,810	4.60	5,040	11.00	19,000
2.00	1,420	3.20	2,940	4.80	5,380	12.00	21,400
2.10	1,540	3.30	3,080	5.00	5,750	13.00	23,900
2.20	1,660	3.40	3,220	5.20	6,110	14.00	26,400
2.30	1,780	3.50	3,360	5.40	6,490		
2.40	1,900	3.60	3,500	5.60	6,880		
2.50	2,030	3.70	3,650	5.80	7,280		

NOTE.—*The above table is based on discharge measurements made during 1903–1906 and is well defined between gage height 2 feet.*

Monthly discharge of Catawba River near Morganton, N. C., for 1906.

[Drainage area, 758 square miles.]

Month.	Discharge in second-feet.			Run-of
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
January	24,200	1,000	3,360	4.43
February	3,080	1,300	1,730	2.28
March	4,550	1,180	1,870	2.47
April	2,810	1,180	1,680	2.22
May	1,780	790	1,180	1.56
June	16,100	740	2,680	3.54

NOTE.—Values are rated as follows: January to April and June, good; May, excellent.

CATAWBA RIVER SURVEY.

In order to point out the power possibilities along Catawba R a profile has been prepared showing the fall between Halltown Ford, N. C., and Camden, S. C. In connection with this su notes showing tributary streams and other natural and artificial tures along the river are indicated.

Sheets showing this profile may be obtained on application t Director of the Geological Survey.

WATEREE RIVER NEAR CAMDEN, S. C.

Camden, S. C., is on Wateree River, 45 miles above its mouth about 5 miles below the fall line. A station has been maintaine the United States Weather Bureau since 1891 at the toll bridge a 2 miles west of Camden. The conditions at this station and bench marks are described in Water-Supply Paper No. 168, pag where are given also references to publications that contain dat previous years.

Discharge measurements of Wateree River near Camden, S. C., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.
		Feet.	*Sq. ft.*	*Feet.*
March 28	W. E. Hall	303	4,690	12.54
October 17	do	288	3,360	8.52

Daily gage height, in feet, of Wateree River near Camden, S. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	10.0	15.2	8.0	19.2	8.2	6.4	7.0	13.6	28.0	15.0	8.8	8.0
.....	10.2	13.6	7.9	17.9	8.1	6.0	10.0	17.8	23.0	13.8	8.5	7.4
.....	9.4	12.4	7.9	14.0	8.2	5.8	14.6	22.6	17.8	12.2	8.6	6.8
.....	25.1	11.3	8.1	11.9	8.7	6.5	11.0	22.5	14.8	14.2	8.2	8.2
.....	28.4	10.4	8.2	10.6	8.0	8.3	10.6	19.8	13.6	22.4	7.7	7.4
.....	25.2	10.6	10.5	10.2	9.8	7.1	9.6	14.6	11.3	21.1	8.7	7.4
.....	18.4	10.2	9.8	9.6	8.7	6.8	8.0	11.8	10.4	16.8	8.2	7.7
.....	13.2	10.2	10.1	8.7	10.0	8.0	11.0	9.8	10.2	14.1	8.0	7.4
.....	11.2	12.2	13.6	8.3	8.9	7.4	8.5	8.8	9.0	13.0	8.0	7.3
.....	9.8	11.8	12.0	9.0	8.4	7.6	9.0	8.6	8.6	11.2	7.8	6.4
.....	9.2	9.8	9.5	8.8	7.4	8.0	9.8	7.9	9.2	10.2	7.5	8.6
.....	8.8	9.2	8.3	8.6	6.8	10.2	8.8	7.6	8.5	9.8	7.3	11.8
.....	14.8	10.0	8.8	8.4	6.6	11.0	7.4	7.2	10.6	9.2	7.8	10.5
.....	16.4	9.4	8.3	8.0	5.9	14.2	6.7	11.2	9.0	8.6	7.6	9.0
.....	13.6	9.1	9.6	8.6	7.0	21.0	6.4	16.2	11.0	8.0	7.8	8.1
.....	13.3	8.9	19.4	9.3	6.2	24.6	5.3	12.0	10.0	9.0	7.6	7.4
.....	12.8	8.6	19.2	14.7	6.1	25.0	10.0	11.6	8.5	8.4	7.8	7.3
.....	11.3	8.4	15.1	12.2	6.0	24.0	13.2	14.6	11.0	8.3	7.7	8.1
.....	10.0	7.9	12.0	10.2	6.2	18.2	13.0	21.0	13.8	21.1	7.3	8.0
.....	9.4	8.6	22.5	9.4	5.65	14.4	17.7	18.6	13.1	27.5	9.0	10.3
.....	8.7	8.6	24.9	8.8	4.8	11.6	15.5	13.8	20.5	28.2	21.4	11.6
.....	8.6	8.8	20.6	8.0	7.0	9.6	12.4	11.6	17.4	23.6	16.4	10.2
.....	19.8	11.0	14.0	7.5	5.35	8.5	14.2	16.7	13.4	18.3	12.2	8.8
.....	27.2	9.3	11.2	8.2	5.5	8.0	16.2	15.7	13.5	15.2	10.3	7.9
.....	28.0	8.8	9.9	7.4	5.7	7.9	14.4	12.2	13.1	12.4	9.2	7.6
.....	25.4	8.0	9.8	7.4	6.0	11.3	15.2	11.8	11.0	11.0	8.3	7.1
.....	27.0	8.7	10.0	7.2	6.0	12.8	14.0	12.6	10.0	10.6	8.6	7.2
.....	26.1	8.2	12.4	7.4	6.5	11.1	16.6	12.6	9.8	9.8	8.4	7.2
.....	26.4	.....	12.8	7.4	8.4	8.6	13.6	20.0	10.7	9.0	8.0	7.6
.....	22.1	.....	14.2	6.8	7.6	7.8	13.6	24.3	12.5	9.4	7.7	7.8
.....	19.6	.....	17.7	.....	6.7	.....	13.8	27.5	.....	9.0	.....	7.4

Rating table for Wateree River near Camden, S. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.80	2,620	6.50	4,150	8.40	5,955	15.00	12,420
4.90	2,710	6.60	4,245	8.60	6,145	16.00	13,520
5.00	2,800	6.70	4,340	8.80	6,335	17.00	14,620
5.10	2,890	6.80	4,435	9.00	6,525	18.00	15,720
5.20	2,980	6.90	4,530	9.20	6,715	19.00	16,820
5.30	3,070	7.00	4,625	9.40	6,905	20.00	17,920
5.40	3,160	7.10	4,720	9.60	7,095	21.00	19,120
5.50	3,250	7.20	4,815	9.80	7,285	22.00	20,320
5.60	3,340	7.30	4,910	10.00	7,475	23.00	21,520
5.70	3,430	7.40	5,005	10.20	7,665	24.00	22,720
5.80	3,520	7.50	5,100	10.40	7,855	25.00	23,920
5.90	3,610	7.60	5,195	10.60	8,045	26.00	25,220
6.00	3,700	7.70	5,290	10.80	8,235	27.00	26,520
6.10	3,790	7.80	5,385	11.00	8,425	28.00	27,820
6.20	3,880	7.90	5,480	12.00	9,420		
6.30	3,970	8.00	5,575	13.00	10,420		
6.40	4,060	8.20	5,765	14.00	11,420		

NOTE.—The above table is based on discharge measurements made during 1904-1906 and is well defined for gage height 13 feet.

Monthly discharge of Wateree River near Camden, S. C., for 1906.

[Drainage area, 2,640 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep ine
January	28,300	6,140	14,800	5.61	
February	12,600	5,480	7,460	2.83	
March	23,800	5.480	9,880	3.74	
April	17,000	4,440	7,330	2.78	
May	7,480	2,620	4,740	1.80	
June	23,900	3,520	8,950	3.39	
July	15,400	3,070	9,020	3.42	
August	27,200	4,820	12,400	4.70	
September	27,800	6,050	10,400	3.94	
October	28,100	5,580	11,600	4.39	
November	19,600	4,910	6,600	2.50	
December	9,220	4,440	5,750	2.18	
The year	28,300	2,620	9,080	3.44	

NOTE.—Values for 1906 are rated as follows: January to October, good; November and Dece fair.

BROAD RIVER (OF THE CAROLINAS) AT ALSTON, S. C.

This station was established July 3, 1896, at the Southern Rail bridge at Alston, S. C., about 27 miles above Columbia. The co tions at this station and the bench marks are described in Wa Supply Paper No. 168, page 28, where are given also reference publications that contain data for previous years.

Discharge measurements of Broad River (of the Carolinas) at Alston, S. C., in 19

Date.	Hydrographer.	Width.	Area of section.	Gage height.	D cha
		Feet.	*Sq. ft.*	*Feet.*	*Se*
March 29	W. E. Hall	521	3,200	5.50	
June 23	do	517	2,680	4.52	
October 18	do	507	2,310	3.79	

Daily gage height, in feet, of Broad River (of the Carolinas) at Alston, S. C., for 1

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	5.1	7.8	3.7	8.3	4.5	3.85	3.7	9.4	11.6	5.9	4.25
2	4.6	6.8	3.95	6.6	4.4	3.8	4.05	13.5	8.5	4.9	4.35
3	6.6	6.2	3.9	6.1	4.4	5.5	3.85	17.5	6.3	6.2	4.1
4	17.8	5.8	4.15	5.4	4.45	5.5	3.85	11.2	6.0	10.1	4.1
5	18.9	5.3	4.6	4.8	4.2	4.75	5.0	6.8	6.2	10.4	4.05
6	12.9	5.4	4.5	4.55	4.6	4.4	4.35	5.6	8.4	8.0	3.9
7	8.6	5.3	4.2	4.75	4.5	4.5	4.05	4.7	8.2	6.7	3.95
8	6.0	5.2	5.4	4.6	5.2	3.8	4.4	4.2	5.8	6.4	4.1
9	5.6	5.2	6.5	4.6	4.7	3.7	6.0	4.3	5.0	5.3	4.0
10	5.0	4.9	5.6	4.8	4.25	3.9	7.0	4.1	4.75	5.0	4.05
11	4.85	4.6	5.0	4.65	4.15	5.7	4.85	4.05	4.6	4.85	3.95
12	8.5	4.6	4.7	4.4	4.0	6.2	5.3	4.45	5.4	4.85	4.05
13	11.3	4.4	4.4	4.2	3.6	7.0	4.5	4.7	6.2	4.8	4.1
14	9.0	4.6	4.4	4.35	3.7	10.2	3.0	7.8	5.0	4.55	4.0
15	7.4	4.6	6.5	5.2	3.65	10.8	3.75	7.7	4.55	4.55	4.2
16	6.6	4.4	11.1	7.2	3.8	9.3	3.8	7.8	4.35	4.55	4.3
17	6.0	4.3	9.2	5.6	3.7	8.2	4.15	7.2	4.05	4.5	4.3
18	5.4	4.2	7.0	5.0	3.7	7.8	6.8	6.7	4.1	4.95	4.3
19	5.0	4.1	7.7	4.55	3.35	6.3	7.6	6.2	7.0	4.55	4.4
20	4.9	4.2	15.7	4.4	3.2	5.7	8.5	6.1	9.9	6.9	5.8

Daily gage height, in feet, of Broad River (of the Carolinas) at Alston, S. C., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
[illegible]	4.75	4.3	13.5	4.25	3.3	4.65	6.1	5.2	8.3	6.4	5.6	6.1
[illegible]	4.9	5.8	9.8	4.2	3.05	4.65	5.3	5.9	7.3	5.2	4.45	5.6
[illegible]	10.6	5.2	6.8	4.25	3.9	4.3	5.7	7.6	6.0	5.1	4.2	4.6
[illegible]	13.0	4.7	5.9	4.9	3.75	4.15	5.7	5.9	6.2	4.9	4.3	4.45
[illegible]	9.0	4.45	5.6	4.0	2.78	4.25	5.9	4.85	6.2	4.4	4.25	4.4
[illegible]	9.2	4.3	5.4	3.9	3.3	6.4	8.5	5.6	5.6	4.3	4.25	4.35
[illegible]	11.8	4.25	5.2	3.95	5.6	6.0	7.4	5.6	6.6	4.15	4.2	4.4
[illegible]	12.0	3.85	5.7	4.2	6.4	5.1	5.4	5.1	6.2	4.4	4.25	3.8
[illegible]	11.7	.....	5.7	4.05	5.6	4.45	4.9	9.8	5.9	4.4	3.2	4.4
[illegible]	10.0	.....	8.5	4.1	4.3	4.15	5.3	13.1	6.4	3.6	3.9	4.45
[illegible]	8.3	.....	10.3	.....	3.9	.....	5.9	15.2	.....	4.2	.....	5.2

Rating table for Broad River (of the Carolinas) at Alston, S. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.70	1,800	4.20	4,750	5.70	8,775	8.40	16,950
2.80	1,940	4.30	5,000	5.80	9,050	8.60	17,600
2.90	2,090	4.40	5,250	5.90	9,325	8.80	18,250
3.00	2,250	4.50	5,500	6.00	9,600	9.00	18,900
3.10	2,420	4.60	5,750	6.20	10,200	10.00	22,150
3.20	2,590	4.70	6,025	6.40	10,800	11.00	25,500
3.30	2,770	4.80	6,300	6.60	11,400	12.00	29,000
3.40	2,960	4.90	6,575	6.80	12,000	13.00	32,800
3.50	3,150	5.00	6,850	7.00	12,600	14.00	36,800
3.60	3,350	5.10	7,125	7.20	13,200	15.00	41,400
3.70	3,560	5.20	7,400	7.40	13,800	16.00	46,500
3.80	3,780	5.30	7,675	7.60	14,400	17.00	52,400
3.90	4,010	5.40	7,950	7.80	15,000	18.00	58,800
4.00	4,250	5.50	8,225	8.00	15,650	19.00	65,300
4.10	4,500	5.60	8,500	8.20	16,300		

NOTE.—The above table is based on discharge measurements made during 1904, 1905, and 1906, and is well defined between gage heights 3 feet and 10 feet.

Monthly discharge of Broad River (of the Carolinas) at Alston, S. C., for 1906.

[Drainage area, 4,610 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	64,600	5,750	18,800	4.08	4.70
February	15,000	3,900	6,[illegible]00	1.47	1.53
March	45,000	3,560	12,000	2.60	3.00
April	16,600	4,010	6,560	1.42	1.58
May	10,800	1,910	4,700	1.02	1.18
June	24,800	3,560	8,860	1.92	2.14
July	17,300	2,250	7,880	1.71	1.97
August	55,600	4,380	14,600	3.17	3.66
September	27,600	4,380	10,900	2.36	2.63
October	23,500	3,350	8,270	1.79	2.06
November	9,050	2,590	4,850	1.05	1.17
December	9,900	2,840	5,190	1.13	1.30
The year	6,460	1,910	9,120	1.98	26.92

NOTE.—Values are rated as follows: January to March and June to September, excellent; April, May, and October to December, good.

BROAD RIVER SURVEY.

In order to show the power possibilities along Broad River a profile has been compiled from data collected by the army engineers showing the fall of the river between Columbia, S. C., and Green River, N. C.

Sheets showing this profile may be obtained upon application to the *Director of the Geological Survey.*

MISCELLANEOUS MEASUREMENTS IN SANTEE RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in Santee River drainage basin during 1906:

John River near Morganton, N. C.—Measurements were made at the highway bridge on the Lenoir road, about 3 miles from Morganton, N. C. The bench mark is the upper edge of the end of a board extending from the floor beam to a brace at the downstream end of the second floor beam from the left pier, 32 feet from the left end of the main span; elevation, 30 feet above the datum of the assumed gage.

March 2: Width, 63 feet; area, 182 square feet; gage height, 1.80 feet; discharge, 36[illegible] second-feet.

June 18: Width, 70 feet; area, 310 square feet; gage height, 3.67 feet; discharge, 1,5[illegible] second-feet.

Green River near Flat Rock, N. C.—Measurements were made at a single 50-foot span wagon bridge, 3½ miles northeast of Flat Rock, N. C and about the same distance downstream from the crossing of the Southern Railway. The bench mark is the top of the drowstream end of the first floor beam from the left end of the bridge; elevation 16 feet above the datum of the assumed gage.

June 13: Width, 45 feet; area, 184 square feet; gage height, 3.30 feet; discharge, 65 second-feet.

September 14: Width, 45 feet; area, 125 square feet; gage height, 1.14 feet; discharge 158 second-feet.

SAVANNAH RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Savannah River is formed by the junction of Tugaloo and Seneca rivers, which unite about 100 miles above Augusta, Ga. It flows in a southeasterly direction, forming the boundary between Georgia and South Carolina, and empties into the Atlantic Ocean near Savannah, Ga. It is navigable to Augusta, which is at the fall line.

Seneca River is formed by the junction of Little and Keowee river, about 5 miles northeast of Seneca, S. C. Both of these tributaries rise in the Blue Ridge in North Carolina and the northwestern part of South Carolina.

Tugaloo River is formed by the junction of Chattooga and Tallulah rivers, which join at the west corner of Oconee County, S. C. It flows in a southeasterly direction, and is a part of the boundary between Georgia and South Carolina. Chattooga River rises in Jackson County, N. C., and flows in a southwesterly direction along the boundary between Georgia and South Carolina. Tallulah River rises in Macon County, N. C., and the northwestern part of Rabun County, [illegible]nd flows in a southeasterly direction. Parts of its course are cut

through solid rock for hundreds of feet, forming canyons and steep bluffs. Throughout its entire length the fall is very great, and at Tallulah Falls the stream drops more than 500 feet in a short distance.

Broad River joins the Savannah at the southeast corner of Elbert County, Ga. It rises in Habersham and Bank counties and flows in a southeasterly direction to the southeast corner of Madison County, Ga., where South Fork joins it. Thence it flows east to Savannah River. Its drainage is from a rolling country, and there is a considerable amount of fall at various points. At Anthony Shoals the fall is more than 50 feet in a short distance. Above Augusta, Ga., there is much fall, which can be developed for water power. With exception of the large plant at Augusta, very little of this is being used.

TALLULAH RIVER AT TALLULAH FALLS, GA.

This station was originally established August 29, 1900, and records of gage heights were obtained until October 19, 1900. The record was resumed January 18, 1901, and maintained until December 31, 1901. The station was reestablished July 10, 1904, when bench marks were determined and regular gage readings begun. The station is located at the wagon bridge about one-fourth mile above the falls and about the same distance from the village of Tallulah Falls, Ga. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 35, and in Water-Supply Paper No. 197, where are given also the data for previous years.

Discharge measurements of Tallulah River at Tallulah Falls, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 24	W. E. Hall	65	554	3.26	1,490
February 14	M. R. Hall	59	126	1.82	577
June 27	W. E. Hall	60	108	1.50	416
July 26	do	60	134	2.20	788
September 28	do	65	556	3.81	2,000
September 29	do	80	691	5.59	4,450
September 29	do	80	691	5.56	4,340
December 31	F. A. Murray	71	595	4.22	2,000
December 31	do	71	588	4.12	2,440

Daily gage height, in feet, of Tallulah River at Tallulah Falls, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.6	2.3	1.7	2.6	2.0	1.4	1.3	2.5	3.7	4.4	2.3	2.1
2	1.5	2.2	1.7	2.6	2.0	2.0	1.3	2.4	3.4	5.0	2.2	2.1
3	7.0	2.2	1.8	2.5	1.9	1.8	1.4	2.3	2.9	5.4	2.2	2.0
4	4.5	2.3	1.8	2.5	1.9	1.7	1.9	3.2	2.7	4.3	2.2	2.0
5	3.0	2.2	1.8	2.4	1.9	1.7	1.5	2.8	2.7	4.1	2.2	2.0
6	2.5	2.2	1.7	2.2	2.0	1.6	1.4	2.4	2.6	4.0	2.2	2.7
7	2.2	2.2	1.7	2.2	2.2	1.6	1.5	2.5	3.4	4.0	2.1	2.1
8	2.1	2.2	1.9	2.2	2.1	1.5	1.5	2.2	2.0	3.8	2.1	2.0
9	2.0	2.1	1.9	2.3	2.0	1.4	1.8	2.0	2.2	3.4	2.1	2.0
10	2.0	2.1	1.8	2.3	2.0	1.4	1.4	1.9	2.8	3.3	2.1	3.3

Daily gage height, in feet, of Tallulah River at Tallulah Falls, Ga., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
11	1.9	2.0	1.8	2.3	1.8	1.7	1.4	1.7	2.7	3.2	2.1	[illegible]
12	2.5	1.9	1.8	2.2	1.7	1.9	1.5	1.3	2.6	3.1	2.1	[illegible]
13	2.2	1.8	1.8	2.1	1.7	2.8	1.5	2.0	3.0	3.0	2.1	[illegible]
14	2.2	1.8	1.9	2.2	1.7	2.6	3.8	2.0	2.6	3.0	2.0	[illegible]
15	2.2	1.7	3.7	2.8	1.6	2.4	3.4	2.1	2.4	3.0	2.0	[illegible]
16	2.0	1.6	2.7	2.6	1.6	2.5	3.2	2.6	2.4	2.8	2.0	[illegible]
17	2.0	1.7	2.6	2.3	1.6	2.4	2.4	3.1	2.4	4.0	2.0	[illegible]
18	2.0	1.7	2.4	2.2	1.5	2.0	4.7	4.1	2.5	3.4	2.3	[illegible]
19	2.0	1.7	4.7	2.0	1.5	1.8	4.0	3.1	3.1	3.1	4.9	[illegible]
20	1.9	1.8	3.4	2.0	1.5	1.7	3.1	3.1	4.4	2.9	3.5	[illegible]
21	1.8	1.7	2.7	2.0	1.5	1.7	3.2	2.9	3.7	2.9	3.0	[illegible]
22	3.8	1.6	2.5	2.0	1.5	1.6	2.6	3.7	3.6	2.8	2.8	[illegible]
23	4.7	1.7	2.5	2.0	1.4	1.5	2.4	2.9	3.5	2.7	2.6	[illegible]
24	3.4	1.7	2.5	1.9	1.4	1.9	2.8	2.4	3.2	2.6	2.4	[illegible]
25	2.9	1.7	2.4	1.9	1.4	1.8	2.3	2.3	2.0	2.5	2.4	[illegible]
26	2.9	1.7	2.5	1.9	1.5	1.8	2.3	2.2	2.9	2.5	2.3	[illegible]
27	2.8	1.9	2.6	2.0	2.2	1.7	2.1	2.2	2.5	2.4	2.3	[illegible]
28	2.8	1.8	2.6	2.0	1.9	1.9	2.8	2.2	2.8	2.4	2.2	[illegible]
29	2.5	.....	2.7	2.1	1.7	2.6	2.1	3.2	4.4	2.4	2.2	[illegible]
30	2.4	.....	3.4	2.1	1.6	1.4	2.5	8.0	5.4	2.4	2.1	[illegible]
31	2.3	.....	2.8	.....	1.5	.....	2.4	4.1	.....	2.4	.....	[illegible]

Rating table for Tallulah River at Tallulah Falls, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.30	355	2.30	860	3.30	1,600	4.60	3,000
1.40	395	2.40	930	3.40	1,690	4.80	3,260
1.50	435	2.50	1,000	3.50	1,780	5.00	3,530
1.60	480	2.60	1,070	3.60	1,880	5.20	3,810
1.70	525	2.70	1,140	3.70	1,980	5.40	4,110
1.80	575	2.80	1,210	3.80	2,080	5.60	4,410
1.90	630	2.90	1,280	3.90	2,180	5.80	4,730
2.00	685	3.00	1,360	4.00	2,290	6.00	5,060
2.10	740	3.10	1,440	4.20	2,510	7.00	6,930
2.20	800	3.20	1,520	4.40	2,750	8.00	9,000

NOTE.—The above table is based on discharge measurements made during 1904–1906 and is well defined below gage height 6 feet.

Monthly discharge of Tallulah River at Tallulah Falls, Ga., for 1906.

[Drainage area, 191 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	6,930	435	1,250	6.54	7.54
February	860	480	640	3.35	3.49
March	3,130	525	974	5.10	5.88
April	1,210	630	816	4.27	4.76
May	800	395	552	2.89	3.33
June	1,210	395	627	3.28	3.66
July	3,130	355	962	5.04	5.81
August	9,000	355	1,350	7.07	8.15
September	4,110	685	1,450	7.59	8.47
October	4,110	930	1,670	8.74	10.08
November	3,390	685	946	4.95	5.52
December	3,530	685	928	4.86	5.60
The year	9,000	355	1,010	5.31	72.29

NOTE.—Values for 1906 are excellent.

TUGALOO RIVER NEAR MADISON, S. C.

his station was originally established July 19, 1898, at Cooks Ferry, was discontinued December 31, 1901, when the ferry was moved. as reestablished July 7, 1903, at Holcombs Ferry, 1 mile west of lison, S. C., and 900 feet below the Southern Railway bridge. station is about 1½ miles above the point where the old station located. The conditions at this station and the bench marks described in Water-Supply Paper No. 168, page 38, where are also references to publications that contain data for previous .

Discharge measurements of Tugaloo River near Madison, S. C., in 1906.

te.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	M. R. Hall	156	557	3.45	1,330
.....	W. E. Hall	160	634	3.68	1,410

Daily gage height, in feet, of Tugaloo River near Madison, S. C., for 1906.

y.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	3.45	5.2	3.6	6.6	4.45	3.25	3.2	7.3	8.0	14.4	5.2	4.6
.....	3.35	5.0	3.5	6.0	4.15	3.5	3.0	6.0	6.8	11.2	5.1	4.55
.....	13.4	4.85	4.25	5.6	4.05	3.65	3.1	5.2	6.3	15.4	5.0	4.5
.....	18.0	4.75	6.6	5.4	4.35	4.5	4.9	6.0	6.0	14.0	4.95	4.45
.....	9.0	4.65	5.6	5.2	4.05	3.7	3.7	5.8	6.4	11.1	4.9	4.35
.....	6.2	4.55	4.55	5.2	3.95	3.7	3.3	5.4	5.8	11.2	4.85	4.3
.....	5.4	4.55	4.25	5.0	4.35	3.35	3.75	5.4	9.4	10.6	5.2	4.8
.....	5.0	4.4	4.85	4.85	4.05	3.25	3.6	5.0	7.3	9.6	4.7	4.3
.....	5.2	4.35	4.65	4.8	3.9	3.15	4.6	4.7	5.7	8.8	4.65	4.3
.....	4.75	4.25	4.35	5.6	3.75	3.3	3.6	4.5	5.5	8.1	4.6	4.2
.....	4.35	4.15	4.15	4.85	3.75	4.2	3.3	4.4	5.2	8.0	4.6	7.1
.....	5.2	4.25	4.05	4.7	3.7	3.4	3.8	4.2	8.0	7.7	4.55	5.1
.....	4.85	4.3	3.95	4.6	3.65	5.8	3.35	4.2	9.2	7.4	4.5	4.7
.....	4.85	4.15	3.95	4.55	3.6	6.9	3.2	4.8	5.6	9.2	4.4	4.6
.....	4.65	4.05	12.2	7.2	3.55	5.2	17.5	7.2	5.3	7.0	4.6	4.45
.....	4.85	3.95	7.2	5.8	3.45	6.2	9.3	7.2	5.1	6.9	4.5	4.3
.....	4.55	3.85	5.6	5.2	3.4	5.4	8.3	5.4	4.95	6.7	4.5	5.9
.....	4.35	3.8	5.0	4.95	3.35	4.7	12.9	12.7	9.2	6.6	9.7	7.4
.....	4.35	3.75	11.2	4.75	3.25	4.15	7.9	7.1	16.2	8.7	11.5	5.4
.....	4.15	3.75	9.0	4.65	3.3	4.0	7.4	7.6	14.0	7.1	8.4	5.6
.....	4.05	3.85	6.8	4.55	3.2	3.75	7.6	6.1	9.5	6.7	6.9	5.3
.....	10.2	4.35	6.0	4.45	3.3	3.55	6.5	6.1	8.8	6.4	6.3	5.2
.....	18.0	3.95	5.6	4.4	3.25	3.4	5.9	6.6	8.1	6.3	5.8	4.8
.....	9.0	3.85	5.2	4.25	3.15	3.7	6.8	6.6	7.7	6.1	5.5	4.6
.....	7.2	3.8	5.0	4.25	3.1	3.6	5.4	5.8	7.4	6.0	5.2	4.4
.....	6.8	3.7	4.95	4.15	3.45	3.75	5.1	5.6	7.3	5.8	5.1	4.35
.....	6.8	3.7	4.95	4.15	5.5	3.4	4.8	6.1	6.9	5.7	5.0	4.3
.....	6.6	3.65	5.2	4.45	3.9	3.3	5.4	5.2	7.3	5.6	5.5	4.5
.....	6.2	.....	5.8	4.25	3.8	3.35	4.9	5.2	11.5	5.5	4.8	4.8
.....	5.8	.....	8.9	4.85	3.5	3.2	5.9	16.8	19.6	5.4	4.7	4.6
.....	5.6	.....	8.4	.....	3.35	.....	7.3	11.4	.....	5.3	.....	15.5

Rating table for Tugaloo River near Madison, S. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	1,075	3.80	1,575	4.60	2,170	5.80	3,180
3.10	1,130	3.90	1,640	4.70	2,250	6.00	3,365
3.20	1,190	4.00	1,[illegible]10	4.80	2,330	6.20	3,555
3.30	1,250	4.10	1,780	4.90	2,410	6.40	3,745
3.40	1,315	4.20	1,855	5.00	2,490	6.60	3,940
3.50	1,380	4.30	1,930	5.20	2,660	6.80	4,140
3.60	1,445	4.40	2,010	5.40	2,830	7.00	4,340
3.70	1,510	4.50	2,090	5.60	3,000		

NOTE.—The above table is based on eleven discharge measurements made during 1905–6, and i defined below gage height 4 feet. Above gage height 6.5 feet the rating curve is a tangent, the diff being 100 per tenth.

Monthly discharge of Tugaloo River near Madison, S. C., for 1906.

[Drainage area, 593 square miles.]

Month.	Discharge in second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
January	15,300	1,280	4,130	6.96
February	2,660	1,480	1,870	3.15
March	9,540	1,380	3,290	5.55
April	4,540	1,820	2,490	4.20
May	2,920	1,130	1,540	2.60
June	4,240	1,160	1,780	3.00
July	14,800	1,080	2,950	4.97
August	14,100	1,860	3,920	6.61
September	16,900	2,450	5,500	9.27
October	12,700	2,740	5,570	9.39
November	8,840	2,010	2,990	5.04
December	12,800	1,860	2,740	4.62
The year	16,900	1,080	3,230	5.45

NOTE.—The monthly values are rated as follows: January, March, and July to December, fair ruary and April to June, good. The values for the low-water periods of the various months are exc

SAVANNAH RIVER AT WOODLAWN, S. C.

This station was established November 9, 1905. It is locate the Charleston and Western Carolina Railway bridge, 1,000 feet f the depot at Woodlawn, S. C., 17 miles above Augusta, Ga., an miles above the Augusta water-power dam. The conditions at station and the bench marks are described in Water-Supply P No. 168, page 40.

Discharge measurements of Savannah River at Woodlawn, S. C., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	I ch.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Se*
November 9	M. R. Hall	409	2,120	3.49	
November 21	F. A. Murray	417	2,200	3.31	
1906.					
March 6	M. R. Hall	594	3,470	5.52	
March 7	do	593	3,290	5.30	
April 26	do	590	3,140	5.04	
June 29	do	535	2,780	4.52	
August 21	do	607	5,350	8.65	
October 30	do	588	3,310	5.30	

Daily gage height, in feet, of Savannah River at Woodlawn, S. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	6.0	6.8	5.0	8.1	5.25	4.6	4.4	9.7	9.2	10.8	5.3	5.1
.....	5.6	6.4	4.9	7.0	5.2	4.2	6.2	8.4	7.2	9.4	5.2	5.0
.....	5.8	6.2	4.95	6.6	5.05	4.5	5.6	8.1	6.4	10.6	5.2	5.0
.....	16.5	6.1	5.1	6.2	5.2	5.65	6.4	7.4	6.0	13.4	5.2	5.05
.....	18.6	5.9	6.5	6.0	5.5	6.7	7.6	7.4	6.3	12.1	5.2	4.9
.....	12.6	5.7	5.6	5.95	5.4	5.6	5.8	6.8	7.0	9.8	5.15	4.9
.....	8.0	5.8	5.3	5.8	6.3	5.05	5.0	6.1	6.3	9.3	5.1	5.1
.....	6.8	6.0	5.8	5.7	7.0	4.7	5.2	5.7	6.0	8.2	5.1	5.2
.....	6.3	6.8	8.8	5.7	6.2	4.5	9.4	5.4	5.5	7.3	5.05	5.0
.....	6.2	6.4	7.6	6.2	5.3	4.55	8.8	5.35	5.35	7.0	5.0	5.0
.....	5.8	6.0	6.4	6.2	5.0	4.9	6.6	5.35	5.2	6.8	5.0	6.2
.....	8.1	6.0	5.8	5.8	4.9	5.1	5.75	5.3	6.8	6.4	5.0	7.9
.....	8.4	5.95	5.35	5.5	4.8	9.7	5.5	5.5	9.2	6.3	5.05	6.3
.....	7.1	6.1	6.4	5.5	4.85	11.3	5.1	6.6	7.7	6.2	5.05	5.7
.....	6.4	5.8	11.4	6.4	4.65	10.0	5.15	6.4	6.0	6.1	5.1	5.4
.....	6.1	5.65	14.6	7.2	4.65	12.0	11.2	6.3	5.55	6.0	5.3	5.2
.....	6.1	5.45	12.2	6.3	4.6	12.4	10.0	6.2	5.2	6.0	5.3	5.2
.....	6.0	5.3	8.3	5.75	4.5	9.9	10.1	6.1	7.5	6.0	5.3	5.35
.....	5.7	5.3	8.2	5.7	4.5	7.7	11.3	6.9	10.1	6.8	6.3	7.0
.....	5.6	5.2	16.7	5.4	4.5	6.2	9.6	*7.8	12.6	7.5	8.4	7.2
.....	5.7	5.5	15.6	5.4	4.45	5.5	8.4	8.8	12.1	6.4	6.9	7.2
.....	5.5	6.2	10.3	5.3	4.4	5.2	7.3	7.6	8.6	6.0	6.1	6.5
.....	14.0	6.1	7.6	5.2	4.4	4.95	7.6	6.4	7.3	5.85	5.75	5.9
.....	19.2	5.5	6.8	4.85	4.5	4.75	6.8	6.0	7.6	5.8	5.6	5.6
.....	13.2	5.3	6.5	5.1	4.5	4.8	7.6	5.8	7.7	5.65	5.4	5.4
.....	11.6	5.2	6.2	5.0	4.4	4.7	7.7	5.2	7.7	5.6	5.3	5.3
.....	12.4	5.1	6.1	5.0	7.0	4.7	6.2	6.8	7.4	5.55	5.3	5.3
.....	11.4	5.0	7.1	5.45	7.5	4.7	5.9	7.4	6.7	5.45	5.25	5.25
.....	9.4	.....	7.3	6.0	5.9	4.5	6.4	8.8	7.2	5.3	5.2	5.35
.....	7.9	.....	7.6	5.6	5.1	4.5	7.1	8.3	8.6	5.3	5.15	5.65
.....	7.1	.....	8.4	.....	4.8	.....	10.5	9.8	.....	5.3	.....	6.2

Rating table for Savannah River at Woodlawn, S. C., for 1905-6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	2,440	4.40	5,760	5.80	10,160	8.40	20,120
3.10	2,640	4.50	6,040	5.90	10,510	8.60	20,940
3.20	2,850	4.60	6,330	6.00	10,860	8.80	21,760
3.30	3,060	4.70	6,630	6.20	11,560	9.00	22,600
3.40	3,280	4.80	6,930	6.40	12,280	10.00	27,000
3.50	3,500	4.90	7,230	6.60	13,010	11.00	31,600
3.60	3,730	5.00	7,540	6.80	13,760	12.00	36,300
3.70	3,960	5.10	7,850	7.00	14,520	13.00	41,100
3.80	4,200	5.20	8,170	7.20	15,300	14.00	46,000
3.90	4,450	5.30	8,490	7.40	16,080	15.00	51,000
4.00	4,700	5.40	8,810	7.60	16,880	16.00	56,000
4.10	4,960	5.50	9,140	7.80	17,680	17.00	61,000
4.20	5,220	5.60	9,480	8.00	18,480	18.00	66,000
4.30	5,490	5.70	9,820	8.20	19,300	19.00	71,000

OTE.—The above table is based on seven discharge measurements made during 1905-6, and is well ned below gage height 8 feet. Above gage height 14 feet the rating curve is a tangent, the differ- e being 500 per tenth.

Monthly discharge of Savannah River at Woodlawn, S. C., for 1905–6.

[Drainage area, 4,[illegible] square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
November 1–[illegible]	4,[illegible]	3,[illegible]	3,820	0.579	[illegible]
December	33,[illegible]	3,730	15,900	2.41	[illegible]
1906.					
January	72,[illegible]	9,140	23,400	3.55	[illegible]
February	33,[illegible]	7,540	10,300	1.56	[illegible]
March	30,[illegible]	7,230	18,900	2.86	[illegible]
April	18,[illegible]	7,080	10,500	1.59	[illegible]
May	16,500	5,760	8,210	1.24	[illegible]
June	38,[illegible]	5,230	12,600	1.91	[illegible]
July	33,[illegible]	5,760	16,100	2.44	[illegible]
August	36,[illegible]	8,170	14,400	2.18	[illegible]
September	30,[illegible]	8,170	16,500	2.50	[illegible]
October	43,[illegible]	8,400	16,000	2.42	[illegible]
November	20,[illegible]	7,540	9,030	1.37	[illegible]
December	18,[illegible]	7,230	9,780	1.48	[illegible]
The year	72,[illegible]	5,230	13,800	2.09	[illegible]

NOTE.—Values for 1905 and 1906 are excellent.

SAVANNAH RIVER AT AUGUSTA, GA.

Observations of river heights have been maintained since 1875 by the city of Augusta, Ga., at the city highway bridge. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 41, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Savannah River at Augusta, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 8	M. R. Hall	561	4,140	9.42	[illegible]
April 27	do	550	3,880	8.89	[illegible]
August 20	do	576	6,590	13.92	[illegible]
October 29	do	557	3,840	9.44	[illegible]

Daily gage height, in feet, of Savannah River at Augusta, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	11.2	12.4	8.9	15.6	9.4	8.2	7.8	19.5	17.8	18.4	9.5	[illegible]
2	10.4	11.9	8.8	13.6	9.4	7.8	12.7	18.4	14.6	18.1	9.4	[illegible]
3	9.9	11.2	8.7	11.9	8.9	7.6	10.7	16.4	12.1	18.6	9.4	[illegible]
4	26.1	10.8	8.8	11.2	9.0	9.5	11.0	13.8	10.7	23.2	9.0	[illegible]
5	29.3	10.8	10.9	11.0	9.7	12.1	13.7	12.6	10.5	22.5	9.1	[illegible]
6	23.9	9.9	10.1	10.5	9.4	10.5	11.5	11.6	12.3	19.2	9.1	[illegible]
7	17.6	10.5	9.5	10.3	10.9	9.5	10.5	11.8	11.7	17.8	9.1	[illegible]
8	13.1	10.4	9.9	10.0	12.8	8.6	9.7	10.6	10.7	16.1	9.0	[illegible]
9	11.6	12.3	16.4	10.0	11.4	8.1	14.6	9.9	9.8	13.8	9.0	[illegible]
10	11.1	12.1	15.2	10.7	9.6	8.0	17.7	9.3	9.8	12.7	9.0	[illegible]
11	10.6	11.0	11.6	11.1	9.0	8.0	13.7	8.9	9.3	12.0	8.8	[illegible]
12	12.6	11.0	10.9	10.6	8.8	9.3	11.5	8.8	9.4	11.7	9.1	[illegible]
13	15.8	11.2	9.8	10.0	8.6	15.4	9.7	9.2	16.9	11.0	9.0	[illegible]
14	14.0	11.1	9.7	9.8	8.5	21.0	9.9	10.8	14.5	10.6	9.0	[illegible]
15	11.8	10.6	11.0	10.7	8.4	19.4	9.1	11.6	12.5	10.6	9.1	[illegible]

Daily gage height, in feet, of Savannah River at Augusta, Ga., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	11.0	10.2	24.3	12.0	8.2	23.7	17.8	11.2	10.6	10.6	9.2	9.2
17	10.8	9.6	22.8	11.5	8.0	24.3	19.5	11.4	9.4	10.5	9.3	9.2
18	10.8	9.5	18.8	10.5	8.0	20.4	18.0	10.6	11.6	10.5	9.2	9.5
19	10.1	9.4	13.4	9.8	8.0	16.0	20.9	11.0	17.9	11.2	10.0	11.1
20	9.9	9.3	26.9	9.6	7.8	12.6	17.9	13.8	21.9	13.5	14.5	12.5
21	9.7	9.2	27.2	9.5	7.8	10.5	16.5	15.2	22.4	11.7	12.7	13.5
22	10.0	10.8	21.5	9.4	7.8	9.4	14.0	14.5	17.5	11.0	11.0	12.1
23	20.0	10.9	15.6	9.5	7.7	9.1	13.9	12.7	14.1	10.5	10.2	10.5
24	28.8	10.1	13.1	8.9	7.8	8.5	12.9	12.3	13.4	10.0	9.9	10.0
25	25.1	9.4	11.8	8.8	8.2	8.6	13.3	10.9	15.9	9.9	9.5	9.5
26	22.6	9.3	11.4	8.8	8.0	9.0	14.2	10.5	14.2	9.9	9.5	9.5
27	24.2	9.2	11.1	8.8	10.5	8.6	12.4	11.3	14.0	9.6	9.3	9.3
28	22.3	9.0	13.2	9.1	13.3	8.7	10.6	12.2	12.7	9.5	9.2	9.3
29	18.8	.....	14.4	10.6	11.2	8.0	11.1	14.8	12.7	9.5	9.2	9.6
30	15.6	.....	13.7	10.2	9.2	7.9	11.9	14.8	15.0	9.4	9.1	10.0
31	13.6	.....	15.2	.....	8.6	.....	19.8	16.6	.....	9.4	.....	10.2

NOTE.—These gage heights are the mean of four readings per day.

Rating table for Savannah River at Augusta, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
7.60	5,100	9.30	8,040	11.00	11,800	16.00	25,900
7.70	5,250	9.40	8,250	11.20	12,260	17.00	29,400
7.80	5,400	9.50	8,460	11.40	12,740	18.00	33,200
7.90	5,560	9.60	8,670	11.60	13,220	19.00	37,300
8.00	5,720	9.70	8,890	11.80	13,700	20.00	41,700
8.10	5,880	9.80	9,110	12.00	14,200	21.00	46,400
8.20	6,040	9.90	9,330	12.20	14,700	22.00	51,500
8.30	6,210	10.00	9,550	12.40	15,220	23.00	57,000
8.40	6,380	10.10	9,770	12.60	15,740	24.00	62,900
8.50	6,550	10.20	9,990	12.80	16,260	25.00	69,000
8.60	6,720	10.30	10,210	13.00	16,800	26.00	75,500
8.70	6,900	10.40	10,430	13.20	17,340	27.00	82,300
8.80	7,080	10.50	10,650	13.40	17,900	28.00	89,500
8.90	7,260	10.60	10,880	13.60	18,460	29.00	97,000
9.00	7,450	10.70	11,110	13.80	19,020	30.00	105,000
9.10	7,640	10.80	11,340	14.00	19,600		
9.20	7,840	10.90	11,570	15.00	22,650		

NOTE.—The above table is based on discharge measurements made during 1904, 1906, and earlier high-water measurements, and is well defined.

Monthly discharge of Savannah River at Augusta, Ga., for 1906.

[Drainage area, 7,300 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	99,400	8,890	30,900	4.23	4.88
February	15,200	7,450	10,600	1.45	1.51
March	83,700	6,900	23,300	3.19	3.68
April	24,600	7,080	10,800	1.48	1.65
May	17,600	5,250	8,020	1.10	1.27
June	64,700	5,100	16,100	2.21	2.47
July	45,900	5,400	19,500	2.67	3.08
August	39,500	7,080	16,200	2.22	2.56
September	53,700	8,040	19,600	2.68	2.99
October	58,200	8,250	18,700	2.56	2.95
November	21,100	7,080	8,820	1.21	1.35
December	18,200	6,900	9,580	1.31	1.51
The year	99,400	5,100	16,000	2.19	29.90

NOTE.—Values for 1906 are good; the records at Woodlawn are better than at Augusta.

BROAD RIVER (OF GEORGIA) NEAR CARLTON, GA.

This station was established May 27, 1897. It is located at t Seaboard Air Line bridge 3 miles east of Carlton, Ga., and 2 mil above the mouth of the South Fork, and is now maintained and t observer paid by the United States Weather Bureau. The gage w read during 1906 by M. C. Power. The conditions at this station a the bench marks are described in Water-Supply Paper No. 168, pa 48, and in Water-Supply Paper No. 197, where are given also da for previous years.

Discharge measurements of Broad River (of Georgia) near Carlton, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis chan
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-*
March 31	W. E. Hall	202	914	4.71	2
July 18	M. R. Hall	196	1,030	5.95	3
October 19	W. E. Hall	200	817	4.10	1

Daily gage height, in feet, of Broad River (of Georgia) near Carlton, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	2.6	3.5	2.4	4.2	2.8	2.4	2.4	3.8	3.7	3.6	2.6	
2	2.5	3.3	2.4	3.5	2.7	2.4	2.4	3.3	3.0	3.9	2.6	
3	4.6	3.0	2.5	3.5	2.7	2.6	2.6	3.2	2.9	5.5	2.6	
4	14.3	2.9	3.0	3.2	3.7	3.4	3.1	3.2	2.7	6.0	2.5	
5	12.9	2.9	2.9	3.2	3.0	2.7	2.8	4.2	2.7	4.7	2.5	
6	7.0	3.0	2.5	3.1	2.8	2.6	2.6	4.4	2.6	4.0	2.5	
7	3.5	3.0	2.5	3.0	3.3	2.5	3.0	3.0	2.8	3.8	2.5	
8	3.3	2.8	3.3	3.0	4.0	2.5	4.3	2.8	2.6	3.6	2.5	
9	3.1	2.7	5.5	3.0	3.5	2.4	6.3	2.6	2.6	3.4	2.5	
10	3.0	2.6	3.9	3.1	3.0	2.4	6.0	2.5	2.6	3.0	2.5	
11	3.0	2.6	3.2	3.0	2.8	3.1	5.0	2.5	2.6	3.0	2.5	
12	3.4	2.6	3.0	3.0	2.7	2.9	3.5	2.4	3.9	3.0	2.5	
13	4.0	2.6	3.0	2.9	2.7	4.4	3.3	2.5	3.2	2.9	2.5	
14	3.0	2.5	2.8	2.9	2.6	5.3	3.6	4.1	3.0	2.8	2.5	
15	2.9	2.5	11.0	3.7	2.5	4.5	4.2	3.4	2.8	2.8	2.6	
16	2.8	2.5	14.0	3.5	2.5	3.8	5.5	3.1	2.5	2.6	2.6	
17	2.8	2.5	8.3	3.1	2.5	5.6	7.9	2.8	2.5	2.6	2.6	
18	2.7	2.5	4.2	3.0	2.5	4.0	6.4	2.6	4.0	2.6	3.0	
19	2.7	2.5	8.8	2.9	2.5	3.6	6.2	8.2	4.5	4.0	3.1	
20	2.6	2.5	15.7	2.8	2.5	2.8	5.2	7.9	8.2	3.6	3.1	
21	2.6	2.6	11.2	2.8	2.4	2.7	4.6	6.4	5.0	2.9	3.0	
22	2.8	2.7	6.0	2.8	2.4	2.6	4.1	5.8	4.0	2.9	3.0	
23	19.0	2.5	3.8	2.7	2.4	2.6	5.0	3.5	3.3	2.8	2.8	
24	9.8	2.5	3.6	2.7	2.4	2.5	4.2	3.1	3.0	2.8	2.7	
25	6.0	2.5	3.5	2.7	2.3	2.5	3.6	2.8	3.9	2.7	2.6	
26	4.4	2.5	3.3	2.7	2.8	2.5	3.2	3.2	4.7	2.6	2.6	
27	6.9	2.5	3.3	2.8	4.1	2.9	2.9	3.1	3.8	2.6	2.6	
28	5.3	2.5	3.8	3.9	3.7	2.7	3.0	3.6	3.2	2.6	2.5	
29	4.0	.....	4.0	3.0	3.2	2.6	3.8	4.6	3.6	2.6	2.5	
30	3.8	.....	4.6	3.0	2.6	2.6	7.6	4.6	4.0	2.6	2.5	
31	3.5	.....	4.8	.....	2.5	.....	4.6	4.0	.....	2.6	.....	

Rating table for Broad River (of Georgia) near Carlton, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.30	645	3.60	1,535	4.90	2,770	9.00	8,220
2.40	695	3.70	1,620	5.00	2,880	10.00	9,760
2.50	750	3.80	1,705	5.20	3,100	11.00	11,360
2.60	805	3.90	1,790	5.40	3,325	12.00	13,000
2.70	865	4.00	1,880	5.60	3,560	13.00	14,700
2.80	930	4.10	1,970	5.80	3,800	14.00	16,400
2.90	1,000	4.20	2,065	6.00	4,050	15.00	18,100
3.00	1,070	4.30	2,160	6.20	4,300	16.00	19,800
3.10	1,140	4.40	2,255	6.40	4,560	17.00	21,500
3.20	1,215	4.50	2,350	6.60	4,820	18.00	23,200
3.30	1,290	4.60	2,450	6.80	5,090	19.00	24,900
3.40	1,370	4.70	2,555	7.00	5,360		
3.50	1,450	4.80	2,660	8.00	6,760		

OTE.—The above table is based on discharge measurements made during 1904 1906 and is well ed below gage height 6 feet. Above gage height 6 feet it is based on one high-water measurement in

Monthly discharge of Broad River (of Georgia) near Carlton, Ga., for 1906.

[Drainage area, 762 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ary	24,900	750	3,620	4.75	5.48
ary	1,450	750	871	1.14	1.19
a	19,300	695	3,630	4.76	5.49
	2,060	865	1,150	1.51	1.68
	1,970	645	989	1.30	1.50
	3,560	695	1,200	1.57	1.75
	6,620	695	2,340	3.07	3.54
st	7,050	695	1,870	2.45	2.82
mber	7,050	750	1,530	2.01	2.24
ber	4,050	805	1,330	1.75	2.02
mber	1,140	750	834	1.09	1.22
mber	2,450	750	1,120	1.47	1.70
The year	24,900	645	1,710	2.24	30.63

OTE.—Values for 1906 are excellent.

MISCELLANEOUS MEASUREMENTS IN SAVANNAH RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements de in Savannah River drainage basin during 1906:

Chauga River near Madison, S. C.—On May 16, 1906, a measurent was made at a new wagon bridge replacing the one formerly d, which was washed away during 1905. The new bridge, which 30 feet upstream from the old location, is 2 miles east of Madison, C., and about 1 mile above mouth of the river. One of the old ch marks was in place and used to preserve the data formerly used establishing new bench marks. The bench mark is the lower side a hole drilled horizontally in the vertical face of a solid rock on the bank, 10 feet above the bridge; elevation, 4.76 feet above the um of the assumed gage.

idth, 51 feet; area, 100 square feet; gage height, 3.48 feet; discharge, 213 second-

Broad River (of Georgia) at Anthony Shoals, Georgia.—Measurements were made by W. J. Lester during September, 1905, to determine the low-water flow for purposes of power development. The gage is an upright post sunk in the river bed at a point one-half mile above the shoals. Measurements were made at different sections.

Discharge measurements of Broad River (of Georgia) at Anthony Shoals, Georgia, in 1905.

Date.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
September 13	224	1,800	2.16	867
September 14	222	1,730	1.82	641
September 15	221	1,690	1.64	530
September 16	206	1,010	1.60	510
September 18	186	592	1.54	464
September 19	186	590	1.53	451
September 25	185	572	1.43	397

OGEECHEE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Ogeechee River is formed by the junction of Williamsons Swamp Creek and Rocky Comfort Creek in Jefferson County, Ga., and drains a small basin in southeastern Georgia lying between the Savannah and Altamaha basins. It flows in a southeasterly direction and empties into the Atlantic Ocean. Its main tributary is Cannoochee River, which rises in Emanuel County, Ga., flows southeastward, and joins it about 20 miles from the Atlantic Ocean. The streams in this basin flow through a country that is mostly low. The current is generally good, but the fall available for power is probably small. The bank on one side or the other of the stream is generally low and swampy.

CANNOOCHEE RIVER NEAR GROVELAND, GA.

This station was established June 12, 1903. It is located at Moody's bridge, 3 miles south of Groveland, Bryan County, Ga. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 51, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Cannoochee River near Groveland, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 7	F. A. Murray	132	1,270	11.21	2,[illegible]
May 25	do	91	345	3.06	[illegible]
August 31	W. E. Hall	108	717	6.65	1,[illegible]

Daily gage height, in feet, of Cannoochee River near Groveland, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.8	10.1	7.7	7.3	2.4	3.4	4.7	9.0	5.8	3.8	2.4	2.1
.....	5.0	9.6	7.0	6.9	2.3	3.1	5.7	10.5	6.0	3.8	2.4	2.1
.....	5.4	8.6	6.8	6.6	2.2	2.9	5.2	13.0	6.2	3.9	2.3	2.1
.....	5.7	7.0	8.9	6.4	2.2	3.9	5.8	11.9	6.1	5.3	2.2	2.2
.....	6.0	6.6	11.7	5.8	2.2	4.5	6.4	10.5	6.0	7.4	2.3	2.5
.....	6.6	6.1	12.5	5.2	2.1	5.7	7.1	10.0	5.9	8.4	2.3	2.5
.....	7.1	6.1	11.4	4.8	2.5	7.6	7.6	9.7	5.8	7.4	2.3	2.7
.....	7.0	7.0	10.0	4.8	5.0	8.4	7.7	9.0	5.0	6.8	2.2	2.9
.....	6.6	7.8	10.4	4.6	5.5	7.5	7.8	8.0	4.6	5.2	2.1	2.7
.....	6.2	9.1	11.1	4.1	4.6	4.7	9.1	7.0	4.0	4.5	2.1	2.5
.....	6.1	10.0	11.3	4.0	4.3	4.2	10.4	6.5	3.6	4.3	2.1	2.3
.....	5.8	11.1	10.9	3.9	3.7	7.0	12.7	5.0	3.3	4.0	2.0	2.3
.....	5.6	11.7	10.5	3.8	3.3	9.6	10.8	5.5	3.3	3.5	2.0	2.3
.....	5.4	12.0	9.9	3.7	3.0	11.9	9.6	4.9	3.3	3.5	2.0	2.3
.....	5.3	11.6	9.2	4.0	2.8	14.0	8.0	4.9	3.0	3.0	2.1	2.3
.....	5.2	11.2	8.3	4.8	2.6	17.0	7.2	5.0	3.3	3.0	2.2	2.2
.....	5.2	11.0	7.4	4.8	2.6	17.2	9.2	4.6	3.3	2.8	2.3	2.1
.....	5.1	10.5	6.8	4.9	2.5	16.4	10.9	4.5	3.4	2.7	2.4	2.0
.....	5.0	9.8	6.4	5.0	2.3	15.2	12.2	4.4	3.4	2.7	2.4	2.0
.....	4.9	8.9	7.0	4.9	2.3	13.2	12.5	4.3	3.5	2.9	2.4	2.0
.....	4.8	7.8	8.6	4.5	2.2	11.4	13.2	3.3	3.4	3.0	2.4	2.0
.....	5.0	8.5	9.7	4.3	2.1	10.2	11.9	4.0	3.2	3.2	2.4	2.1
.....	5.1	9.8	9.5	3.9	2.0	8.2	10.9	4.5	3.1	3.2	2.4	2.3
.....	6.4	10.3	9.4	3.3	2.1	7.2	10.7	6.0	3.0	3.1	2.4	2.5
.....	6.7	9.2	9.3	3.1	3.8	6.6	10.9	6.8	3.4	3.0	2.4	2.6
.....	7.5	9.42	8.9	3.0	4.8	5.5	11.9	6.4	3.6	2.9	2.3	2.6
.....	9.0	8.5	8.0	2.8	5.1	4.4	12.4	6.2	3.8	2.9	2.2	2.6
.....	10.3	8.2	7.3	2.6	4.4	4.3	12.2	6.5	4.3	2.8	2.2	2.6
.....	11.1	.....	7.0	2.5	4.2	4.1	10.5	5.8	4.3	2.7	2.1	2.6
.....	10.5	.....	7.2	2.4	3.8	4.4	9.4	5.8	3.9	2.7	2.1	2.7
.....	10.7	.....	7.4	.....	3.5	.....	8.3	5.8	.....	2.7	.....	2.9

Rating table for Cannoochee River near Groveland, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	75	3.30	257	4.60	554	6.80	1,183
2.10	85	3.40	276	4.70	580	7.00	1,245
2.20	96	3.50	296	4.80	606	7.20	1,309
2.30	107	3.60	317	4.90	633	7.40	1,373
2.40	119	3.70	338	5.00	660	7.60	1,438
2.50	131	3.80	360	5.20	714	7.80	1,504
2.60	144	3.90	382	5.40	769	8.00	1,570
2.70	158	4.00	405	5.60	825	9.00	1,915
2.80	172	4.10	429	5.80	882	10.00	2,275
2.90	187	4.20	453	6.00	940	11.00	2,650
3.00	203	4.30	478	6.20	1,000	12.00	3,025
3.10	220	4.40	503	6.40	1,060		
3.20	238	4.50	528	6.60	1,121		

NOTE.—The above table is based on discharge measurements made during 1903-1906 and is well defined below gage height 6.2 feet. Above gage height 10 feet the rating curve is a tangent, the difference being per foot.

Monthly discharge of Cannoochee River near Groveland, Ga., for 1906.

[Drainage area, 960 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in in
January	2,090	606	1,120	1.17	
February	3,020	970	2,010	2.09	
March	3,210	1,060	1,920	2.00	
April	1,340	119	539	.561	
May	797	75	272	.283	
June	4,980	187	1,750	1.82	
July	3,480	580	2,120	2.21	
August	3,400	257	1,230	1.28	
September	1,000	203	468	.488	
October	1,710	158	432	.450	
November	119	75	102	.106	
December	187	75	118	.123	
The year	4,980	75	1,010	1.05	

NOTE.—Values are rated as follows: January to April and June to October, good; May, Noven and December, fair.

ALTAMAHA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Altamaha River is formed by the junction of Oconee and Ocmul rivers, which unite at the southern boundary of Montgomery Coun Ga. Ohoopee River is also a tributary and enters it from the no side, about 50 miles below the junction of the Oconee and Ocmulg The Altamaha River drainage basin is entirely within the State Georgia. The river rises in the north-central part and flows in southeasterly direction, emptying into the Atlantic Ocean n Darien. Below the junction of the Oconee and Ocmulgee and fo long distance above on both rivers there is no great amount of f Steamboat navigation is carried on from Darien to Macon on t Ocmulgee, and to Dublin, and at times to Milledgeville, on t Oconee.

Ohoopee River rises in Washington County and flows in a sou easterly direction to the Altamaha. It flows from low hills of sou eastern Georgia into the flat pine lands. Though it has not so mu fall as the more northern streams, it has considerable fall that can developed into power.

Oconee River rises on the southern slope of the Chattahooch Ridge, in Hall County, and joins the Middle Oconee on the southw boundary of Clarke County. Thence it flows in a southeasterly dir tion to the Altamaha. Apalachee River is a large tributary whi rises in Gwinnett and Walton counties and enters the Oconee near t southeast corner of Morgan County. Little River enters the m stream at the corner of Putnam, Hancock, and Baldwin counti about 15 miles above Milledgeville, Ga. These tributaries have mu

and a small part of it is developed. The Oconee has a fall of 250 in 45 miles. It has some very large water powers available from ource down to Milledgeville, where it crosses the fall line.

cmulgee River, the westernmost of the main tributaries, rises in north-central part of Georgia on the southern slope of the Chattachee Ridge, in Fulton, Dekalb, and Gwinnett counties. It is ned by the junction of Yellow and South rivers just south of the th corner of Newton County. Yellow River rises in Gwinnett nty and flows in a southerly direction into the Ocmulgee. South er rises in Fulton and Dekalb counties and flows in a southeasterly ction. Alcovy River joins the Ocmulgee about 5 miles below the ction of South and Yellow rivers. Towaliga River enters the nulgee at about the southwest corner of Jasper County.

ll these tributaries rise in and flow through a very hilly country have a great deal of fall. Ocmulgee River has a fall of over 210 in 35 miles. The last fall of much size is only a few miles above con, Ga.

OCMULGEE RIVER NEAR JACKSON, GA.

his station, located at Pittmans Ferry, 8 miles southeast from kson, Ga., was established on May 18, 1906, to take the place of old Flovilla station 5 miles below, the conditions being much re favorable for a constant rating.

leasurements are made from a boat, but as the meter is susded from the ferry cable the boat is merely for carrying the drographer. The vertical gage is at the right bank about 15 feet ve the ferry landing. Section 0 to 7 feet is attached to a post, ich is securely placed and braced to a tree, and section 7 feet to feet is attached to the tree. The observer is C. A. Pittman.

he section is deep at the measuring point and may change conerably, owing to the filling of the bed, but the permanent rock al about 400 feet below will control the height of water at the e.

he bench mark is the top of an iron-pipe post firmly planted et south of a cedar tree, which is 20 feet south of the road and feet west of the gage; elevation, 27.99 feet above gage datum.

Discharge measurements of Ocmulgee River near Jackson, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
14	F. A. Murray	298	1,530	4.92	1,680
18	do	298	1,140	4.43	920
ber 9	W. E. Hall	300	1,670	5.19	2,170
ber 10	do	300	1,610	5.02	1,810

Daily gage height, in feet, of Ocmulgee River near Jackson, Ga., for 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		4.4	4.4	5.6	5.1	4.9	4.5	4.5
2		4.4	4.4	5.3	5.4	10.8	4.4	4.5
3		4.5	4.5	5.1	5.5	12.4	4.4	4.5
4		5.8	4.7	5.5	4.8	12.4	4.5	4.5
5		4.7	4.5	5.6	4.6	9.2	4.5	4.5
6		4.5	4.45	5.6	4.5	6.6	4.5	4.45
7		4.45	4.4	5.3	4.4	6.0	4.5	4.45
8		4.4	4.45	5.2	4.4	5.5	4.5	4.6
9		4.4	5.8	4.8	4.4	5.3	4.5	4.55
10		4.4	5.3	4.6	4.4	5.1	4.5	4.5
11		4.4	4.8	4.6	4.4	4.9	4.5	4.8
12		4.4	4.7	4.7	4.4	4.8	4.5	5.0
13		12.9	4.5	4.5	5.3	4.8	4.5	4.8
14		12.4	4.5	6.6	4.8	4.8	4.5	4.7
15		9.9	5.0	5.5	4.5	4.7	4.7	4.65
16		8.2	5.2	5.2	4.4	4.7	4.75	4.6
17		7.8	4.8	5.0	4.3	4.7	4.7	4.6
18	4.4	7.0	5.5	5.0	4.8	4.6	4.8	4.8
19	4.4	6.0	6.7	4.7	5.5	5.1	5.4	4.95
20	4.4	5.55	6.2	4.6	5.5	5.0	5.0	5.2
21	4.4	5.1	5.4	4.6	6.8	4.8	4.8	5.25
22	4.5	5.0	5.0	4.5	6.0	4.7	4.75	5.1
23	4.45	4.8	6.6	6.0	5.9	4.7	4.75	4.9
24	4.45	4.7	6.7	5.4	5.6	4.7	4.65	4.8
25	4.45	4.6	5.5	4.8	6.0	4.7	4.65	4.7
26	4.45	4.6	5.4	4.7	5.4	4.6	4.6	4.6
27	4.7	4.6	4.9	5.0	5.0	4.6	4.55	4.6
28	4.75	4.5	4.7	4.9	5.5	4.6	4.55	4.7
29	4.7	4.5	5.9	5.1	5.2	4.6	4.5	5.0
30	4.55	4.45	5.4	5.5	5.1	4.55	4.5	5.25
31	4.5	.....	5.9	5.3	.....	4.55	.....	6.0

Rating table for Ocmulgee River near Jackson, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.30	750	5.40	2,560	6.50	5,000	8.20	9,700
4.40	870	5.50	2,760	6.60	5,250	8.40	10,300
4.50	1,000	5.60	2,970	6.70	5,510	8.60	10,920
4.60	1,140	5.70	3,180	6.80	5,770	8.80	11,540
4.70	1,290	5.80	3,390	6.90	6,030	9.00	12,170
4.80	1,450	5.90	3,610	7.00	6,300	10.00	15,500
4.90	1,620	6.00	3,830	7.20	6,840	11.00	18,900
5.00	1,800	6.10	4,060	7.40	7,380	12.00	22,300
5.10	1,980	6.20	4,290	7.60	7,940	13.00	25,700
5.20	2,170	6.30	4,520	7.80	8,510		
5.30	2,360	6.40	4,760	8.00	9,100		

NOTE.--The above table is based on four discharge measurements made during 1906 and is well defined below gage height 5.2 feet. Above gage height 6 feet the curve becomes uncertain and is only approximate at the higher stages.

Monthly discharge of Ocmulgee River near Jackson, Ga., for 1906.

[Drainage area, 1,500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
May (18–31)	1,370	870	1,020	0.680	0.36
June	25,400	870	4,070	2.71	3.02
July	5,510	870	2,240	1.49	1.72
August	5,250	1,000	2,080	1.39	1.60
September	5,770	750	2,030	1.35	1.51
October	23,700	1,070	4,010	2.67	3.08
November	2,560	870	1,180	.787	.88
December	3,830	935	1,450	.967	1.11

NOTE.--Values are rated as follows: May, July to September, November, and December, excellent; June and October, good.

OCMULGEE RIVER AT MACON, GA.

:ation was established at Macon, Ga., January 21, 1893, by the l States Weather Bureau. Discharge measurements were by the United States Geological Survey in 1895, and a wire vas established on the bridge of the Macon, Dublin and Savan- .ailroad and was set on the same datum as the Weather Bureau For a time gage-height records were maintained by the Geo- l Survey, as the Weather Bureau records were for a part of the ɔnly and were discontinued altogether from June 30, 1897, to 1, 1899. Since June 1, 1899, the Weather Bureau gage-height ls have been taken continuously and have been furnished to eological Survey. The conditions at this station and the bench s are described in Water-Supply Paper No. 168, page 58, and ater-Supply Paper No. 197, where are given also data for pre- years.

Discharge measurements of Ocmulgee River at Macon, Ga., in 1906.

te.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	F. A. Murray	255	2,130	4.54	2,500
.....	do	231	1,440	2.40	1,300
29.....	W. E. Hall	228	3,160	9.14	5,040
11.....	do	257	1,890	4.91	2,530

Daily gage height, in feet, of Ocmulgee River at Macon, Ga., for 1906.

ıy.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	5.2	6.2	3.5	9.2	3.2	2.2	3.3	8.2	4.7	4.8	2.9	2.8
.....	4.8	6.0	3.4	8.0	3.1	2.1	2.4	6.5	6.7	16.6	2.9	2.7
.....	5.0	5.4	4.2	6.9	3.0	2.0	2.5	5.6	8.5	17.6	2.9	2.8
.....	16.1	5.3	4.2	6.1	3.3	3.4	2.8	4.9	6.9	18.2	2.8	2.9
.....	15.3	4.9	4.5	5.7	3.4	5.2	2.9	8.1	4.5	17.6	2.9	2.9
.....	14.2	4.8	4.1	5.4	3.4	3.0	2.6	7.1	3.7	12.9	2.9	2.8
.....	10.5	4.5	3.8	5.2	3.5	2.4	2.4	6.6	3.5	13.3	2.9	2.9
.....	9.9	4.9	4.1	5.0	4.8	2.1	2.3	9.2	3.0	9.3	2.8	3.0
.....	7.3	6.5	9.7	4.9	4.8	2.0	3.5	5.0	2.5	7.2	2.8	3.1
.....	6.4	5.6	11.0	5.5	4.0	2.1	6.6	3.8	2.4	6.0	2.8	2.9
.....	6.4	5.3	8.5	6.3	3.4	2.1	4.9	3.5	2.7	5.1	2.7	2.9
.....	5.9	5.0	6.9	5.7	3.2	2.0	3.6	3.0	2.6	4.5	2.8	4.0
.....	7.0	5.0	6.2	5.1	3.2	13.5	3.3	3.2	3.2	4.2	2.9	4.2
.....	6.6	4.8	5.2	4.8	3.1	18.0	2.9	4.4	5.0	4.1	2.9	3.6
.....	6.3	4.5	8.7	5.0	2.9	17.2	4.3	11.2	3.2	3.8	3.2	3.4
.....	5.4	4.2	14.1	4.8	2.8	17.0	4.5	9.5	2.6	3.8	3.6	3.2
.....	5.1	4.1	14.5	4.5	2.7	13.4	4.5	5.3	2.3	3.6	3.5	3.0
.....	5.0	4.1	11.8	4.2	2.6	12.9	4.8	4.2	2.2	3.6	3.5	3.4
.....	4.8	4.0	9.5	4.1	2.5	10.4	7.7	4.1	6.2	3.8	5.5	4.1
.....	4.7	3.9	16.3	4.0	2.5	8.0	10.5	3.3	7.2	4.6	5.4	6.1
.....	4.7	4.1	17.0	3.9	2.3	5.9	9.2	3.2	8.1	4.5	4.8	5.6
.....	5.2	4.9	15.9	3.9	2.3	5.1	6.3	4.4	9.8	3.8	4.1	5.2
.....	19.9	4.0	12.5	3.8	2.4	5.1	7.9	7.3	7.6	3.7	3.9	4.5
.....	14.3	3.9	9.9	3.5	2.4	4.0	10.0	7.8	7.4	3.5	3.6	3.9
.....	11.3	3.9	8.2	3.3	2.2	3.5	9.0	5.1	8.5	3.5	3.4	3.6
.....	11.9	3.9	7.0	3.3	2.4	3.2	6.4	3.8	8.2	3.4	3.1	3.3
.....	12.0	3.8	6.3	3.3	2.2	3.2	5.9	4.6	5.5	3.2	3.1	3.2
.....	11.0	3.6	11.0	3.2	3.2	3.1	4.2	5.6	6.7	3.1	3.0	3.1
.....	9.6	.....	11.9	3.3	3.2	2.8	3.7	9.8	5.9	3.0	2.9	3.6
.....	8.5	.....	10.3	3.3	2.9	2.6	8.3	8.5	5.4	2.9	2.8	5.1
.....	7.2	.....	10.7	.....	2.5	.....	9.2	7.7	.....	2.9	.....	6.8

Rating table for Ocmulgee River at Macon, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	1,075	3.50	1,750	5.00	2,610	8.00	4,580
2.10	1,110	3.60	1,800	5.20	2,730	9.00	5,340
2.20	1,150	3.70	1,855	5.40	2,850	10.00	6,240
2.30	1,190	3.80	1,910	5.60	2,980	11.00	7,270
2.40	1,230	3.90	1,965	5.80	3,110	12.00	8,400
2.50	1,270	4.00	2,020	6.00	3,240	13.00	9,600
2.60	1,315	4.10	2,075	6.20	3,372	14.00	10,900
2.70	1,360	4.20	2,130	6.40	3,504	15.00	12,300
2.80	1,405	4.30	2,190	6.60	3,636	16.00	13,800
2.90	1,450	4.40	2,250	6.80	3,768	17.00	15,400
3.00	1,500	4.50	2,310	7.00	3,900	18.00	17,100
3.10	1,550	4.60	2,370	7.20	4,032	19.00	18,900
3.20	1,600	4.70	2,430	7.40	4,164	20.00	20,800
3.30	1,650	4.80	2,490	7.60	4,300		
3.40	1,700	4.90	2,550	7.80	4,440		

NOTE.—The above table is based on discharge measurements made during 1903-1906 and well defined.

Monthly discharge of Ocmulgee River at Macon, Ga., for 1906.

[Drainage area, 2,420 square miles.]

Month.	Discharge in second-feet.			Run-o
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
January	20,600	2,430	5,820	2.40
February	3,570	1,800	2,430	1.00
March	15,400	1,700	5,980	2.47
April	5,520	1,600	2,560	1.06
May	2,490	1,150	1,520	.628
June	17,100	1,080	4,170	1.72
July	6,740	1,190	2,890	1.19
August	7,490	1,500	3,300	1.36
September	6,060	1,150	2,860	1.18
October	17,500	1,450	4,510	1.86
November	2,920	1,360	1,670	.690
December	3,770	1,360	1,890	.781
The year	20,600	1,080	3,300	1.36

NOTE.—Values for 1906 are good.

ALCOVY RIVER NEAR STEWART, GA.

This station was established September 16, 1905. It is loca a single-span steel wagon bridge known as "Waters Bridge," ab miles south of Covington, Ga., and 5 miles from Stewart, Ga. bridge is below the mouth of Bear Creek and about 4 miles fro mouth of the river. The station is important because it is a distance below a large amount of fall at the old Newton factor The gage which was read during 1906 by C. M. Fincher is attac a birch tree on the right edge of stream, 40 feet upstream from b Rocks on which bench mark is cut are about 20 feet above b The conditions at this station and the bench marks are descri Water-Supply Paper No. 168, page 61, and in Water-Supply No. 197.

Monthly discharge of Savannah River near Stewart, Ga., for 1906.

[Drainage area, [illegible] square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	[illegible]	[illegible]	818	2.07	2.39
February	[illegible]	[illegible]	393	.995	1.04
March	[illegible]	[illegible]	824	2.09	2.41
April	[illegible]	[illegible]	383	.970	1.08
May	[illegible]	[illegible]	252	.638	.74
June	[illegible]	[illegible]	764	1.93	2.15
July	[illegible]	[illegible]	582	1.47	1.70
August	[illegible]	[illegible]	481	1.22	1.41
September	[illegible]	[illegible]	518	1.31	1.46
October	[illegible]	[illegible]	635	1.61	1.86
November	[illegible]	[illegible]	305	.772	.86
December 1-28	[illegible]	[illegible]	335	.848	.73
The period	[illegible]	170	524	1.32	17.86

NOTE.—Values for 1906 are excellent.

APALACHEE RIVER NEAR BUCKHEAD, GA.

This station was established February 13, 1901. It is located at the iron wagon bridge over Apalachee River, about 3½ miles north of Buckhead, Ga. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 63, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Apalachee River near Buckhead, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 19	Hall and Murphy	86	386	3.28	[illegible]
April 28	M. R. Hall	85	309	2.51	[illegible]
June 28	do	82	239	2.01	[illegible]
August 17	do	85	368	3.36	[illegible]
October 17	do	83	221	1.99	[illegible]

Daily gage height, in feet, of Apalachee River near Buckhead, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	4.2	2.5	4.9	2.9	2.05	2.3	9.0	2.6	3.5	2.3	[illegible]
2	4.2	3.9	2.55	4.3	2.6	2.0	2.1	5.4	4.0	4.8	2.35	[illegible]
3	4.8	3.6	2.7	3.8	2.35	4.5	2.5	3.8	3.2	5.7	2.3	[illegible]
4	13.0	3.4	2.95	3.6	2.3	3.6	3.1	4.3	2.5	7.2	2.3	[illegible]
5	14.2	3.3	2.7	3.4	2.4	2.6	2.5	6.2	2.35	6.1	2.3	[illegible]
6	9.8	3.4	2.7	3.3	2.3	2.35	2.0	4.2	2.25	4.8	2.3	[illegible]
7	6.4	3.4	2.9	3.2	3.3	2.2	2.15	3.5	2.2	3.5	2.3	[illegible]
8	5.2	3.5	3.7	3.0	4.4	2.1	3.6	3.4	2.15	3.1	2.3	[illegible]
9	4.0	3.4	6.3	2.95	3.7	2.0	10.0	3.6	1.9	2.7	2.35	[illegible]
10	4.1	3.3	6.4	4.8	2.8	2.05	8.7	2.7	1.7	2.65	2.35	[illegible]
11	3.3	3.3	4.3	4.1	2.45	2.1	3.5	2.85	2.0	2.55	2.35	[illegible]
12	3.8	3.2	2.5	3.5	2.3	2.3	3.6	2.65	2.35	2.5	2.6	[illegible]
13	4.7	3.1	2.85	3.1	2.25	7.6	2.9	2.4	3.1	2.4	2.55	[illegible]
14	4.2	3.0	3.0	2.5	2.2	11.5	2.4	2.7	2.7	2.2	2.5	[illegible]
15	3.7	3.0	7.0	3.9	2.15	13.1	4.2	7.0	2.3	2.2	2.6	[illegible]
16	3.5	2.95	12.5	3.4	2.15	13.2	6.7	7.7	1.9	2.3	2.55	[illegible]
17	3.4	2.8	10.5	3.1	2.1	10.5	5.4	3.6	1.7	2.2	2.5	[illegible]
18	3.1	2.8	6.0	2.9	2.1	13.9	7.5	3.1	2.1	2.15	3.0	[illegible]
19	3.0	2.6	7.2	2.75	2.1	8.0	6.6	3.8	5.7	2.5	3.5	[illegible]
20	3.1	2.7	14.8	2.6	2.0	4.0	5.8	3.0	6.0	2.7	3.8	[illegible]

Daily gage height, in feet, of Apalachee River near Buckhead, Ga., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	2.9	3.1	15.3	2.6	1.9	3.4	4.1	2.9	6.8	2.5	3.1	3.8
22	6.3	3.2	9.4	2.6	2.05	3.0	3.2	2.8	5.2	2.3	2.7	3.5
23	19.9	3.9	5.7	2.45	2.05	2.8	6.0	2.85	4.3	2.45	2.65	3.1
24	15.1	2.75	4.7	2.45	2.1	2.6	5.8	2.95	3.8	2.45	2.6	2.6
25	8.0	2.7	3.6	2.5	2.2	2.4	6.4	3.1	3.4	2.5	2.45	2.4
26	7.8	2.7	3.0	2.5	2.35	3.4	3.2	2.4	3.3	2.4	2.4	2.35
27	9.4	2.7	3.1	2.5	2.55	2.85	2.7	3.4	3.5	2.3	2.4	2.3
28	8.3	2.6	4.5	2.6	2.5	2.45	2.55	3.6	3.6	2.3	2.4	2.85
29	6.8	.....	5.1	3.0	2.4	2.4	3.0	3.5	3.8	2.3	2.3	3.55
30	5.5	.....	5.2	4.1	2.2	2.3	6.2	3.6	3.1	2.35	2.15	3.8
31	4.8	.....	6.9	.....	2.1	.....	8.2	2.95	.....	2.2	.....	4.6

Rating table for Apalachee River near Buckhead, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.70	264	2.20	384	2.70	520	3.20	670
1.80	286	2.30	410	2.80	550	3.30	700
1.90	310	2.40	436	2.90	580	3.40	730
2.00	334	2.50	464	3.00	610	3.50	760
2.10	358	2.60	492	3.10	640		

NOTE.—The above table is based on discharge measurements made during 1903-1906, and is fairly well defined below gage height 7.3 feet. Above gage height 3 feet the rating curve is a tangent, the difference being 30 per tenth.

Monthly discharge of Apalachee River near Buckhead, Ga., for 1906.

[Drainage area, 440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	5,680	580	1,650	3.75	4.32
February	970	492	658	1.50	1.56
March	4,300	464	1,380	3.14	3.62
April	1,180	450	675	1.53	1.71
May	1,030	310	449	1.02	1.18
June	3,880	334	1,110	2.52	2.81
July	2,710	334	1,090	2.48	2.86
August	2,410	436	894	2.03	2.34
September	1,750	264	674	1.53	1.71
October	1,870	371	623	1.42	1.64
November	850	371	478	1.09	1.22
December	1,090	310	538	1.22	1.41
The year	5,680	264	852	1.94	26.38

NOTE.—At times the accuracy of the above results may be more or less affected by daily fluctuations caused by stored water above, but otherwise the results can, in general, be accepted as excellent.

OCONEE RIVER NEAR GREENSBORO, GA.

This station was established July 25, 1903. It is located at the new wagon bridge, about 5 miles west of Greensboro, on the road to Madison, Ga. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 66, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Oconee River near Greensboro, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis char
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-*
February 10	M. R. Hall	122	861	3.62	1,
April 28	do	122	843	4.35	1,
June 28	do	118	471	2.13	
August 17	do	121	863	5.75	2,
October 17	do	118	514	2.70	

Daily gage height, in feet, of Oconee River near Greensboro, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1	3.5	5.1	3.6	5.6	3.4	2.0	1.8	8.4	5.6	3.5	2.5	
2	3.5	5.0	3.6	5.4	3.0	1.8	4.9	8.4	3.6	5.7	2.5	
3	3.8	4.9	3.8	5.4	2.7	4.3	2.6	3.7	2.8	6.1	2.4	
4	13.9	4.5	3.5	5.2	2.9	5.6	3.3	9.5	2.6	8.7	2.4	
5	16.3	3.8	3.4	5.0	2.9	3.3	2.1	7.7	2.3	10.2	2.3	
6	16.8	3.6	3.2	4.0	2.9	2.3	2.0	6.2	2.4	9.3	2.4	
7	12.5	3.8	2.0	4.1	5.2	2.1	2.1	5.2	3.6	5.8	2.5	
8	9.3	4.0	2.8	3.6	4.6	2.0	6.5	3.7	2.6	4.2	2.4	
9	5.1	3.8	4.3	3.4	3.7	1.7	7.6	3.1	2.2	3.6	2.4	
10	4.8	3.7	8.2	5.5	3.0	2.3	8.2	2.8	2.2	3.4	2.4	
11	4.5	3.7	4.9	4.0	2.6	2.0	4.5	2.6	2.7	3.2	2.3	
12	4.7	3.5	4.5	3.7	2.5	3.7	3.7	2.5	2.6	3.0	2.6	
13	5.2	3.5	3.0	3.7	2.5	8.6	3.1	2.6	5.6	2.9	2.5	
14	5.2	3.3	2.8	4.0	2.4	10.8	2.6	3.4	3.7	2.8	2.6	
15	5.1	3.2	8.6	4.1	2.3	12.3	7.4	5.2	2.5	2.8	2.9	
16	4.3	3.1	13.5	4.2	2.3	10.4	7.9	5.7	2.2	2.8	2.8	
17	4.3	3.1	16.3	3.5	2.2	11.3	7.5	5.3	2.0	2.7	2.7	
18	4.0	3.0	15.2	3.2	2.2	7.4	10.3	4.1	2.3	2.7	3.8	
19	3.4	3.0	10.1	3.1	2.1	4.5	12.3	4.3	5.3	3.7	3.7	
20	3.6	2.9	14.9	3.0	2.0	3.4	9.9	5.1	8.4	4.3	3.4	
21	3.6	2.9	18.5	3.0	1.9	3.1	5.4	6.8	8.4	3.5	2.9	
22	6.5	3.4	18.1	2.9	2.3	2.8	3.8	8.2	8.0	3.0	2.8	
23	16.5	3.0	10.5	2.8	2.1	2.6	8.2	5.9	6.1	2.9	2.8	
24	18.9	3.0	6.1	2.7	1.9	2.2	7.5	4.0	4.0	2.7	2.6	
25	16.2	3.0	6.0	2.6	1.9	2.2	5.0	3.4	4.8	2.7	2.5	
26	11.3	3.9	5.8	2.6	2.3	3.0	4.3	4.0	4.1	2.7	2.5	
27	10.4	3.8	5.5	2.5	2.6	2.4	3.0	4.6	5.8	2.5	2.5	
28	9.8	3.8	5.8	4.2	3.2	2.3	2.9	4.7	5.9	2.5	2.4	
29	8.6	.....	5.6	4.7	2.3	2.1	3.5	4.9	5.3	2.5	2.4	
30	7.0	.....	5.6	4.2	2.2	2.0	6.9	5.8	3.8	2.8	2.2	
31	6.3	.....	5.5	.....	1.9	.....	11.0	4.9	.....	2.5	.....	

Rating table for Oconee River near Greensboro, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.70	620	3.00	1,090	4.30	1,670	6.20	2,660
1.80	655	3.10	1,130	4.40	1,720	6.40	2,770
1.90	690	3.20	1,170	4.50	1,770	6.60	2,880
2.00	725	3.30	1,210	4.60	1,820	6.80	3,000
2.10	760	3.40	1,250	4.70	1,870	7.00	3,120
2.20	795	3.50	1,295	4.80	1,920	8.00	3,740
2.30	830	3.70	1,340	4.90	1,970	9.00	4,410
2.40	865	3.70	1,385	5.00	2,020	10.00	5,110
2.50	900	3.80	1,430	5.20	2,120	11.00	5,840
2.60	935	3.90	1,475	5.40	2,220	12.00	6,590
2.70	970	4.00	1,520	5.60	2,330		
2.80	1,010	4.10	1,570	5.80	2,440		
2.90	1,050	4.20	1,620	6.00	2,550		

NOTE.—The above table is based on discharge measurements made during 1903–1906 and is well defined below gage height 10.5 feet. Above gage height 10.4 feet the rating curve is a tangent, the difference being 75 per tenth.

Monthly discharge of Oconee River near Greensboro, Ga., for 1906.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary	11,800	1,250	4,100	3.73	4.30
ruary	2,070	1,010	1,330	1.21	1.26
ch	11,500	725	3,640	3.31	3.82
il	2,330	900	1,480	1.35	1.51
	2,120	690	971	.883	1.02
	6,820	620	1,860	1.69	1.89
	6,820	655	2,480	2.25	2.59
ust	4,760	900	2,120	1.93	2.22
ember	4,000	725	1,670	1.52	1.70
ber	5,250	900	1,590	1.45	1.67
ember	1,430	795	955	.868	.97
mber	2,440	795	1,210	1.10	1.27
The year	11,800	620	1,950	1.77	24.22

OTE.—Values for 1906 are excellent.

OCONEE RIVER AT FRALEYS FERRY, NEAR MILLEDGEVILLE, GA.

This station is located at Fraleys Ferry, about 6 miles above Milgeville, Ga., and about 4 miles below the mouth of Little River. is point, being above the dam at Milledgeville, has a nearly natural w, being but slightly affected by dams a great distance upstream. The channel is straight for some distance above and below the station. The current is moderate or slow at low stages. The bed is ndy and changing, but the rock shoals below will probably control e water level at the station.

Discharge measurements are made from the ferryboat or from a nall boat controlled by the ferry cable, along which the distances e marked. Measurements can be made at low and medium stages ly, as at higher stages the current soon becomes too swift for fety in boat measurements.

The gage is a heart-pine timber bolted to solid rock on the left bank 00 feet above the ferry and capped with a 1 by 2 inch walnut gage, hich reads from 4.1 feet to 9 feet. The gage is read twice a day by esse Cummings. The bench mark is a point and circle cut into solid ck on the left bank 35 feet from edge of water and 20 feet above the rry cable; elevation, 17.02 feet above gage datum. These are set accord with the former temporary gage used during October and ovember, 1905.

ischarge measurements of Oconee River at Fraleys Ferry, near Milledgeville, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ay 23	F. A. Murray	273	1,960	5.59	1,540
ctober 12	W. E. Hall	276	1,910	6.02	2,260

Daily gage height, in feet, of Oconee River at Fraleys Ferry, near Milledgeville, Ga 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	5.4	5.6	8.8	6.8	7.2	5.6
2	.....	5.4	5.6	8.2	7.2	(a)	5.6
3	.....	5.6	6.0	7.5	6.8	(a)	5.6
4	.....	6.8	6.8	7.7	6.0	8.7	5.6
5	.....	6.8	6.3	7.9	5.8	8.4	5.6
6	.....	5.9	5.6	7.3	5.6	8.8	5.6
7	.....	5.6	6.4	7.0	5.5	8.0	5.6
8	.....	5.6	6.9	6.6	5.5	7.0	5.6
9	.....	5.5	8.6	6.3	5.5	6.4	5.6
10	.....	5.6	8.8	6.0	5.4	6.2	5.6
11	.....	5.6	7.4	5.8	5.6	6.2	5.6
12	.....	5.9	6.3	5.8	5.6	6.0	5.7
13	.....	(a)	6.2	6.0	6.6	6.0	5.8
14	.....	(a)	7.0	6.4	6.6	5.9	5.7
15	.....	(a)	7.9	7.4	6.0	5.9	5.9
16	.....	(a)	8.2	7.8	5.5	5.9	6.0
17	.....	(a)	7.9	8.2	5.4	5.8	6.1
18	.....	(a)	8.4	7.0	5.9	5.9	6.1
19	.....	8.6	11.0	6.4	7.2	6.0	6.4
20	.....	7.4	8.2	6.8	8.0	6.4	6.6
21	.....	6.6	7.2	7.3	8.0	6.2	6.2
22	.....	7.0	7.4	7.1	7.8	6.0	6.0
23	5.6	6.8	7.2	6.8	7.0	5.9	5.9
24	5.5	6.0	8.0	6.6	7.1	5.8	5.8
25	5.5	5.8	7.2	6.2	7.1	5.8	5.8
26	5.6	5.8	6.6	6.2	6.6	5.8	5.7
27	5.8	6.2	6.2	5.4	7.2	5.8	5.6
28	6.0	5.9	6.0	7.2	7.5	5.7	5.6
29	5.9	5.6	6.6	6.8	7.0	5.6	5.7
30	5.7	5.6	8.5	7.0	6.6	5.6	5 6
31	5.5	.....	8.8	6.8	.....	5.6	.....

a Water over the gage.

Rating table for Oconee River at Fraleys Ferry near Milledgeville, Ga., for 1905-

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.30	530	5.00	1,000	5.70	1,770	6.40	2,860
4.40	580	5.10	1,090	5.80	1,900	6.50	3,040
4.50	640	5.20	1,190	5.90	2,040	6.60	3,220
4.60	700	5.30	1,290	6.00	2,190	6.70	3,410
4.70	770	5.40	1,400	6.10	2,350	6.80	3,600
4.80	840	5.50	1,520	6.20	2,520	6.90	3,800
4.90	920	5.60	1,640	6.30	2,690	7.00	4,000

NOTE.—The above table is based on five discharge measurements made during 1904-1906, and is defined below gage height 6 feet.

OCONEE RIVER AT DUBLIN, GA.

A station was established by the United States Weather Bureau 1894 at Dublin, Ga., about 60 miles above the junction of the Oco with the Ocmulgee. Records were kept, with the exception of summer months of 1896, until April 30, 1897, when the station discontinued. In 1898 discharge measurements were commenced the United States Geological Survey, and February 11 an obser was employed to read the gage. October 15, 1898, the Weat Bureau again adopted the station and has maintained the gage furnished gage heights to the Geological Survey continuously si that time. The conditions at this station and the bench marks

scribed in Water-Supply Paper No. 168, page 71, and in Water-pply Paper No. 197, where are given also data for previous years.

Discharge measurements of Oconee River at Dublin, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
16	F. A. Murray	237	1,690	3.14	4,320
16	do	237	1,690	3.11	4,300
28	do	222	957	.82	2,280
mber 1	W. E. Hall	258	2,150	5.50	6,560

Daily gage height, in feet, of Oconee River at Dublin, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	6.9	13.9	3.1	9.7	1.4	1.6	1.3	6.7	5.6	3.9	0.5	1.0
	6.2	11.8	2.7	10.0	2.4	1.5	.9	7.8	7.5	2.7	.5	.9
	5.6	8.9	2.7	9.2	2.4	1.5	.9	8.3	5.0	5.6	.2	.7
	5.6	7.6	2.5	7.7	2.2	1.4	1.9	8.9	4.0	6.8	.2	.8
	7.5	6.4	3.0	6.5	1.8	1.4	2.5	8.5	3.0	8.2	.7	.8
	8.5	4.4	3.3	5.0	1.5	1.6	2.9	6.9	2.5	9.1	.7	.7
	10.0	4.7	3.3	3.5	1.2	1.8	2.6	6.9	2.0	9.1	.6	.7
	12.6	4.4	3.0	3.0	1.0	2.1	1.9	5.9	1.5	9.8	.5	1.0
	14.4	5.7	4.0	3.0	1.5	1.8	3.9	4.5	1.5	10.0	.5	1.0
	14.4	7.2	5.6	2.7	2.3	1.0	4.2	3.4	1.0	10.3	.7	1.0
	13.3	6.2	6.9	2.5	3.0	.8	4.9	2.5	.9	9.0	.6	1.0
	10.0	6.9	7.3	4.3	2.2	.6	6.2	1.7	.7	8.0	.6	1.0
	6.4	6.5	6.5	5.0	1.5	.3	7.1	1.4	.7	4.0	.7	1.7
	6.0	6.3	4.9	4.2	1.5	.3	6.0	1.5	1.0	2.0	.6	2.7
	6.1	6.5	4.0	3.3	1.2	5.6	4.5	1.7	1.5	1.5	.7	3.6
	5.7	5.5	3.5	2.9	.9	7.7	5.8	1.9	2.0	1.0	1.5	2.6
	4.8	4.9	6.7	3.0	.8	11.1	6.5	2.0	2.5	.3	1.5	1.3
	4.3	3.9	7.7	3.8	.8	14.7	7.2	2.4	2.0	1.0	1.8	1.5
	4.4	3.3	9.5	3.2	.7	18.7	7.7	3.4	1.8	1.0	1.7	2.8
	3.8	3.3	12.5	3.0	.7	18.2	8.0	4.5	1.2	1.5	2.0	2.0
	3.7	3.5	15.0	2.4	.8	17.0	9.0	5.6	1.9	1.8	2.6	4.5
	3.4	3.4	15.7	2.0	.9	14.6	9.9	4.8	4.5	2.0	2.8	5.3
	4.2	4.6	15.7	2.2	1.0	13.0	10.2	5.5	5.0	2.5	2.0	4.5
	4.5	4.4	16.4	1.8	1.0	6.8	9.0	6.0	6.0	1.5	1.7	3.5
	9.2	4.0	17.5	1.7	1.2	3.9	8.0	5.0	4.8	1.0	1.5	3.0
	14.7	3.2	16.7	1.6	1.4	2.0	7.4	4.2	3.8	1.0	1.7	3.0
	19.1	3.0	14.0	1.4	1.3	1.6	8.0	3.0	3.7	.9	1.0	3.0
	19.2	3.0	13.1	1.0	1.3	1.5	8.0	3.3	3.4	.7	1.0	1.7
	18.8	.....	9.0	.9	1.6	2.0	6.0	5.5	3.0	1.0	1.0	1.6
	17.0	.....	7.8	1.0	1.7	1.6	4.0	6.5	4.8	1.0	1.0	1.5
	15.2	.....	8.5	.....	1.6	.....	5.0	6.0	.....	.7	.....	2.0

Rating table for Oconee River at Dublin, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.20	1,800	1.60	2,945	3.00	4,150	5.80	6,870
.30	1,880	1.70	3,030	3.20	4,330	6.00	7,090
.40	1,960	1.80	3,115	3.40	4,510	7.00	8,190
.50	2,040	1.90	3,200	3.60	4,695	8.00	9,390
.60	2,120	2.00	3,285	3.80	4,885	9.00	10,640
.70	2,200	2.10	3,370	4.00	5,075	10.00	11,900
.80	2,280	2.20	3,455	4.20	5,265	11.00	13,430
.90	2,360	2.30	3,540	4.40	5,455	12.00	14,930
1.00	2,440	2.40	3,625	4.60	5,650	13.00	16,500
1.10	2,520	2.50	3,710	4.80	5,850	14.00	18,100
1.20	2,605	2.60	3,795	5.00	6,050	15.00	19,800
1.30	2,690	2.70	3,880	5.20	6,250		
1.40	2,775	2.80	3,970	5.40	6,450		
1.50	2,860	2.90	4,060	5.60	6,650		

TE.—The above table is based on discharge measurements made during 1903-1906, and is well defined gage height 7 feet. *Above gage height 14 feet* the rating curve is a tangent, the difference being er tenth.

Monthly discharge of Oconee River at Dublin, Ga., for 1906.

[Drainage area, 4,180 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	26,900	4,510	11,800	2.82	3.25
February	17,900	4,150	6,920	1.66	1.73
March	24,000	3,710	10,400	2.49	2.87
April	12,000	2,360	4,990	1.19	1.33
May	4,150	2,200	2,810	.672	.77
June	26,100	1,880	7,480	1.79	2.00
July	12,300	2,360	6,820	1.63	1.88
August	10,500	2,780	5,910	1.41	1.63
September	8,790	2,200	4,190	1.00	1.12
October	12,400	1,880	5,280	1.26	1.45
November	3,970	1,800	2,540	.608	.68
December	6,350	2,200	3,320	.794	.92
The year	26,900	1,800	6,040	1.44	19.63

NOTE.—Values for 1906 are probably excellent except those for May which are fair, owing to erroneous gage heights.

OHOOPEE RIVER NEAR REIDSVILLE, GA.

This station was established June 13, 1903. It is located at the wooden highway bridge known as Sheppards Bridge, 4½ miles west of Reidsville, Ga. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 75, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Ohoopee River near Reidsville, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 8	F. A. Murray	128	1,150	7.75	2,220
May 26	do	113	590	3.57	642
August 30	W. E. Hall	133	1,340	9.09	3,130

Daily gage height, in feet, of Ohoopee River near Reidsville, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.8	8.7	6.2	6.3	1.1	3.5	4.6	8.6	8.1	3.2	1.2	1.0
2	8.8	8.3	6.0	6.1	1.0	2.8	3.7	8.4	7.2	3.4	1.2	.9
3	8.7	7.9	6.1	5.8	1.0	3.9	3.5	7.6	7.8	4.8	1.0	.9
4	8.9	7.5	7.9	5.5	1.0	5.0	3.5	7.3	7.0	5.2	.9	.8
5	9.0	7.2	8.1	5.1	1.0	7.6	4.7	7.4	6.3	6.5	.9	.8
6	9.1	6.9	7.6	4.7	1.4	9.9	5.0	7.5	5.1	5.0	.9	.7
7	9.3	6.5	7.5	4.4	1.9	9.5	5.1	6.8	4.9	4.7	.8	.7
8	9.6	6.5	7.7	4.1	2.9	8.9	5.8	5.9	4.3	4.3	.8	.9
9	9.2	7.2	8.1	3.7	3.5	7.8	6.0	4.3	3.8	4.0	.8	1.2
10	8.8	8.0	8.4	3.5	3.5	6.2	5.2	4.6	3.4	3.9	.8	1.7
11	8.3	8.5	8.2	3.3	3.3	4.4	4.2	4.0	2.9	3.7	.7	1.6
12	8.0	8.9	8.2	3.3	2.8	4.1	4.5	3.3	2.3	3.1	.7	1.4
13	7.7	9.2	8.0	3.0	2.0	6.0	4.2	3.6	2.9	2.7	.8	1.2
14	7.3	9.4	7.6	2.9	1.7	7.4	4.5	3.2	2.6	2.5	.8	1.0
15	7.1	9.5	7.1	3.0	1.5	8.4	4.9	2.9	3.7	2.3	.9	1.0
16	7.0	9.3	6.8	3.2	1.4	7.9	5.0	3.1	3.8	2.1	1.2	1.0
17	6.8	9.0	6.4	3.7	1.2	10.1	5.9	3.9	3.9	2.0	1.6	1.0
18	6.6	8.7	6.1	3.4	1.0	10.6	6.6	4.3	3.8	2.0	1.7	1.0
19	6.6	8.1	5.8	3.0	1.0	10.6	7.0	3.4	3.6	2.1	1.8	1.2
20	6.6	7.6	6.9	2.8	.9	11.0	7.8	2.9	3.4	2.3	1.8	1.7

Daily gage height, in feet, of Ohoopee River near Reidsville, Ga., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	6.3	7.5	7.6	2.7	.9	10.9	9.2	2.3	3.9	2.4	1.9	2.0
22	6.1	8.1	8.0	2.4	.9	10.0	8.4	2.8	3.4	2.4	1.8	2.3
23	6.5	8.2	8.7	2.2	.9	9.2	7.6	3.1	3.2	2.3	1.7	2.3
24	7.0	8.0	9.0	2.0	1.3	8.1	7.3	4.1	3.1	2.3	1.6	2.3
25	7.5	7.6	8.6	1.8	2.5	7.2	7.3	4.8	2.9	2.1	1.6	2.3
26	8.0	7.2	7.7	1.7	3.5	6.5	7.5	5.2	2.7	2.0	1.6	2.3
27	8.5	6.8	7.2	1.5	4.0	5.9	7.2	6.7	3.1	1.9	1.5	2.0
28	9.0	6.5	6.8	1.4	4.5	5.5	6.9	8.1	3.4	1.8	1.2	2.0
29	9.4	.....	6.8	1.3	4.8	5.3	7.8	8.6	3.5	1.7	1.1	2.0
30	9.3	.....	6.7	1.2	5.1	5.2	8.6	9.1	3.3	1.6	1.0	2.1
31	9.0	.....	6.7	.....	4.4	.....	9.0	8.9	.....	1.6	.....	2.4

Rating table for Ohoopee River near Reidsville, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.70	83	2.10	283	3.50	600	5.80	1,438
.80	93	2.20	302	3.60	629	6.00	1,520
.90	104	2.30	321	3.70	659	6.20	1,602
1.00	115	2.40	341	3.80	690	6.40	1,685
1.10	127	2.50	361	3.90	722	6.60	1,771
1.20	140	2.60	382	4.00	755	6.80	1,860
1.30	153	2.70	403	4.20	824	7.00	1,950
1.40	167	2.80	425	4.40	895	8.00	2,430
1.50	182	2.90	447	4.60	968	9.00	2,950
1.60	197	3.00	470	4.80	1,043	10.00	3,500
1.70	213	3.10	494	5.00	1,120	11.00	4,120
1.80	230	3.20	519	5.20	1,198		
1.90	247	3.30	545	5.40	1,277		
2.00	265	3.40	572	5.60	1,357		

NOTE.—The above table is based on discharge measurements made during 1903-1906 and is well defined.

Monthly discharge of Ohoopee River near Reidsville, Ga., for 1906.

[Drainage area, 1,280 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	3,280	1,560	2,470	1.93	2.22
February	3,220	1,730	2,420	1.89	1.97
March	2,950	1,440	2,140	1.67	1.92
April	1,640	140	619	.484	.54
May	1,160	104	359	.280	.32
June	4,120	425	2,210	1.73	1.93
July	3,060	600	1,600	1.25	1.44
August	3,000	321	1,370	1.07	1.23
September	2,480	321	858	.670	.75
October	1,720	197	520	.406	.47
November	247	83	146	.114	.13
December	341	83	189	.148	.17
The year	4,120	83	1,240	.970	13.09

NOTE.—Values are rated as follows: January to April and June to October, excellent; May, November, and December, good.

ST. JOHNS RIVER DRAINAGE BASIN.

SILVER SPRINGS AT SILVER SPRINGS, FLA.

Silver Springs form the outlet of an underground stream or system of streams so large that steamboats run on the stream leading from it into the basin of the spring. This water flows eastward about 9 miles into the Oklawaha River, which has its source in a number of lakes in central Florida, and flows north for a considerable distance, then eastward into the St. Johns River, which empties into the Atlantic Ocean.

On May 25, 1906, a station was established at Silver Springs for the purpose of observing the amount and fluctuation of the flow from this remarkable spring. The vertical gage is attached to a post in the basin, and discharge measurements are made from a boat at a point on the outlet stream just below.

The bed of the stream is sandy and is covered with vegetation, making it difficult to measure. At the point usually measured the width is about 100 feet, with a depth of 10 feet.

A measurement was made May 26, 1906, by W. E. Hall, with the following results:

Width, 110 feet; area, 876 square feet; gage height, 3.02 feet; discharge, 545 second-feet.

Daily gage height, in feet, of Silver Springs at Silverspring, Fla., for 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			3.45	4.2	4.35	3.15	3.8	3.7
2			3.45	4.2	4.35	3.1	3.8	3.7
3		3.05	3.45	4.05	4.35	3.1	3.8	3.7
4		3.0	3.45	4.0	4.3	3.05	3.8	3.7
5		3.0	3.45	4.0	4.3	3.05	3.8	3.7
6		3.0	3.5	4.0	4.25	3.05	3.8	3.7
7		3.0	3.5	3.95	4.2	3.05	3.8	3.7
8		3.0	3.5	3.95	4.2	3.0	3.85	3.6
9		3.05	3.5	3.95	4.2	3.0	3.85	3.6
10		3.15	3.5	3.9	4.15	3.0	3.85	3.6
11		3.15	3.55	3.9	4.1	3.0	3.8	3.6
12		3.35	3.6	3.95	4.1	3.25	3.8	3.6
13		3.6	3.7	4.0	4.1	3.4	3.8	3.6
14		3.4	3.75	4.05	4.05	3.6	3.8	3.6
15		3.4	3.8	4.05	4.05	3.75	3.8	3.6
16		3.4	3.85	4.1	4.05	3.85	3.8	3.6
17		3.45	4.1	4.05	4.05	3.9	3.75	3.6
18		3.5	4.1	4.0	4.0	3.9	3.75	3.6
19		3.5	4.05	4.05	4.0	3.9	3.75	3.6
20		3.45	4.05	4.1	3.05	3.9	3.75	3.6
21		3.45	4.0	4.15	3.05	3.9	3.75	3.6
22		3.45	4.0	4.2	3.05	3.9	3.75	3.6
23		3.45	4.05	4.2	3.05	3.85	3.75	3.6
24		3.45	4.1	4.2	3.1	3.85	3.75	3.55
25	3.0	3.45	4.1	4.25	3.1	3.85	3.75	3.55
26	3.1	3.4	4.2	4.3	3.1	3.8	3.75	3.55
27	3.1	3.4	4.05	4.3	3.05	3.8	3.75	3.55
28	3.1	3.45	4.05	4.35	3.05	3.8	3.7	3.55
29	3.1	3.45	4.0	4.4	3.05	3.8	3.7	3.5
30	3.05	3.45	4.05	4.4	3.1	3.8	3.7	3.5
31	3.05	.....	4.1	4.35	.....	3.8	.....	3.5

EASTERN GULF STATES DRAINAGES.

ΓHLACOOCHEE RIVER (OF FLORIDA) DRAINAGE BASIN.

MISCELLANEOUS MEASUREMENT.

'he following miscellaneous discharge measurement was made on :hlacoochee River May 24, 1906, at an old wagon bridge about 10 es southeast of Dade City, Fla.:

idth, 25 feet; area, 26 square feet; discharge, 11 second-feet.

SUWANEE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

ɔuwanee River and its principal tributary, Withlacoochee River of ɔrgia, drain a considerable area in the southern-central portion of ɔrgia. These unite after passing into Florida and continue a south- ; course to the Gulf of Mexico, about 10 miles north of Cedar Keys. e eastern branch—Suwanee River—drains a portion of the Okefino- ; Swamp, in Georgia, and Santa Fe River, a tributary from the east, ning in lower down, drains the upper central portion of Florida ng west of St. Johns River.

SUWANEE RIVER AT WHITE SPRINGS, FLA.

This station was established on May 28, 1906. It is located at the nty bridge, in the town of White Springs, about 600 feet above the nt where the flow from White Spring enters the river.

Measurements are made from the single-span steel bridge and the ɔtle approaches.

'he standard chain gage is bolted to the top plank of the down- ɔam fencing, in the second panel of the bridge from the right bank. ;in length is 47.33 feet. The gage is read once a day by J. H. Hunt. 'he river channel is cut through soft rock, but the bed is sandy and some moss and other vegetation. The current is moderately slow, oming sluggish at low water.

'he bench mark is the top of the downstream end of the second floor m from the right bank; elevation, 41 feet above the datum of the e.

Discharge measurements of Suwanee River at White Springs, Fla., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
16	W. E. Hall	88	307	2.68	154
26	do	131	1,860	15.67	5,350

Daily gage height, in feet, of Suwanee River at White Springs, Fla., for 1906.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	10.8	17.6	15.5	12.5	5.3	3.8	2.9
2	.....	9.8	16.1	15.0	12.9	5.7	3.8	2.9
3	.....	8.7	14.6	14.8	13.0	6.2	3.8	2.9
4	.....	8.1	13.5	14.8	13.3	6.4	3.7	2.9
5	.....	7.8	12.6	14.5	13.0	6.1	3.6	2.9
6	.....	8.0	13.7	15.4	12.7	6.0	3.6	2.9
7	.....	8.8	14.3	15.0	12.1	5.8	3.6	2.9
8	.....	8.7	14.0	14.2	11.8	5.7	3.4	2.8
9	.....	8.5	13.8	13.5	11.1	5.6	3.4	2.8
10	.....	8.3	12.7	12.9	10.9	5.4	3.3	2.8
11	.....	8.5	13.0	12.2	10.5	5.3	3.3	2.8
12	.....	9.2	19.0	11.5	10.1	5.1	3.2	2.8
13	.....	12.1	21.9	11.0	9.5	4.9	3.2	2.8
14	.....	13.0	21.7	10.4	9.3	4.8	3.2	2.8
15	.....	12.9	23.0	10.0	9.0	4.7	3.2	2.8
16	.....	13.5	23.2	10.0	8.7	4.6	3.2	2.8
17	.....	20.1	22.2	10.3	8.0	4.5	3.1	2.8
18	.....	21.1	21.5	10.0	7.8	4.5	3.1	2.8
19	.....	20.5	20.1	9.5	7.4	4.4	3.1	2.8
20	.....	20.1	18.6	9.0	7.1	4.4	3.1	2.8
21	.....	20.2	17.4	8.6	6.7	4.4	3.1	2.8
22	.....	20.3	17.8	8.3	6.4	4.4	3.1	2.8
23	.....	20.5	17.5	8.3	6.1	4.4	3.0	2.7
24	.....	20.5	18.2	9.0	5.8	4.3	3.0	2.7
25	.....	20.4	18.0	9.3	5.7	4.2	3.0	2.7
26	.....	20.1	16.8	9.7	5.6	4.2	3.0	2.7
27	.....	19.6	16.4	9.2	5.5	4.1	3.0	2.7
28	15.6	19.2	15.8	9.5	5.5	4.0	3.0	2.7
29	14.8	18.5	16.3	10.0	5.5	4.0	3.0	2.7
30	13.3	18.0	15.6	11.0	5.3	3.9	2.9	2.7
31	12.0	.....	15.4	11.9	.....	3.9	.....	2.7

MISCELLANEOUS MEASUREMENTS IN SUWANEE RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in Suwanee River drainage basin during 1906:

Suwanee River near Suwanee, Fla.—A measurement was made May 17, 1906, at a single-span steel truss bridge about 1 mile northeast from Suwanee railroad station. The bench mark is the top of the downstream end of second floor beam from right end of the bridge; elevation, 35 feet above the datum of the assumed gage.

Width, 95 feet; area, 330 square feet; gage height, 2.78 feet; discharge, 317 second-feet.

Suwanee River at Ellaville, Fla.—A measurement was made May 18, 1906, at the Seaboard Air Line Railway bridge, about 300 feet below junction of Withlacoochee and Suwanee rivers. The bench mark is top of upstream end of second floor beam from left end of the bridge; elevation, 41 feet above the datum of the assumed gage.

Width, 250 feet; area, 2,260 square feet; gage height, 5.45 feet; discharge, 4,630 second-feet.

Suwanee Springs near Suwanee, Fla.—A measurement was made May 17, 1906, between the spring outlet and the river, about 200 feet below the wagon bridge.

Width, 5 feet; area, 13 square feet; discharge, 44 second-feet.

Withlacoochee River near Ousley, Ga.—A measurement was made May 22, 1906, at a low wooden wagon bridge 4 miles west of Valdosta,

[illegible] through a very hilly and steep country and [illegible] its course.

[illegible] to Columbus, Ga., Chattahoochee River is [illegible] water-power stream. Two of the water-power plants [illegible] West Point. From the lower edge of Lumpkin County down to Columbus [illegible] there is a fall of over 850 feet, 366 feet of this fall being between West Point and Columbus. All along its course there are many small tributaries flowing from a high, hilly country. These have much fall and many water powers are available.

CHATTAHOOCHEE RIVER NEAR NORCROSS, GA.

This station was established June 10, 1902. It is located at Medlock's toll bridge, about 4½ miles north of Norcross, Ga., above the mouth of Johns Creek and below the mouth of Sewannee Creek. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 80, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Chattahoochee River near Norcross, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February [illegible]	[illegible]	174	1,240	3.11	2,190
June 11	M. E. Hall	286	1,630	2.53	1,630
July 28	M. E. Hall	173	1,590	3.70	2,970
August [illegible]	M. E. Hall	166	1,450	3.45	2,670
October 27	[illegible]	168	1,430	3.60	2,790

Daily gage height, in feet, of Chattahoochee River near Norcross, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.75	3.05	2.6	5.1	3.15	2.6	2.45	5.2	6.2	6.2	3.45	3.1
2	2.65	3.5	2.6	4.4	3.05	2.7	2.3	4.3	5.0	7.8	3.4	3.1
3	6.0	3.4	2.9	4.2	3.0	3.1	2.3	4.2	4.3	11.0	3.35	3.1
4	14.6	3.3	4.4	3.95	3.7	2.75	2.8	3.8	4.1	10.4	3.3	3.1
5	12.2	3.25	3.45	3.8	3.3	2.8	2.6	4.4	5.0	7.0	3.3	3.0
6	5.5	3.3	3.05	3.7	3.15	2.85	2.75	3.85	5.8	6.2	3.3	3.0
7	4.4	3.2	2.95	3.7	4.0	2.7	5.0	4.2	4.8	6.6	3.3	3.1
8	4.0	3.15	4.0	3.6	3.6	2.5	3.8	3.75	5.5	5.6	3.3	3.05
9	3.95	3.1	4.0	3.6	3.2	2.5	5.2	3.35	4.8	5.0	3.25	3.0
10	3.7	3.05	3.45	3.9	3.05	2.45	4.0	3.15	6.0	4.8	3.2	3.2
11	3.5	3.0	3.25	3.65	2.9	2.5	3.0	3.1	4.4	4.5	3.2	3.7
12	3.9	3.0	3.0	3.5	2.9	2.65	3.3	3.0	4.8	4.4	3.25	4.4
13	4.2	3.0	3.0	3.4	2.9	5.0	3.4	3.6	4.0	4.2	3.2	3.8
14	3.75	3.0	3.45	3.35	2.8	4.85	3.9	3.45	3.7	4.1	3.15	3.4
15	3.55	2.95	11.5	3.6	2.8	3.9	7.7	5.4	3.5	4.0	3.3	3.3
16	3.8	2.9	11.1	3.85	2.75	3.85	6.6	6.8	3.4	4.0	3.35	3.3
17	3.9	2.8	5.4	3.55	2.7	3.35	4.7	3.9	3.3	3.9	3.3	3.8
18	3.6	2.8	4.3	3.4	2.7	3.05	8.0	7.3	3.7	4.2	3.85	3.4
19	3.5	2.8	9.0	3.3	2.65	2.9	7.6	8.6	7.0	6.0	6.0	4.4
20	3.4	2.8	14.2	3.3	2.65	2.8	5.6	7.8	7.6	4.4	4.9	4.1
21	3.25	2.8	6.8	3.2	2.6	2.65	5.7	6.8	6.0	4.0	4.1	4.2
22	4.5	2.9	5.2	3.2	2.6	2.5	4.7	4.1	5.9	3.95	3.85	3.85
23	9.4	2.85	4.6	3.15	2.6	2.5	5.1	4.1	5.1	3.85	3.65	3.65
24	6.5	2.75	4.2	3.1	2.5	2.5	5.8	3.8	5.8	3.8	3.45	3.45
25	4.8	2.7	4.0	3.1	2.5	3.05	5.0	3.45	4.8	3.75	3.4	3.35
26	4.4	2.7	3.85	3.1	3.0	2.7	3.8	3.4	5.3	3.7	3.3	3.25
27	4.8	2.7	3.9	3.2	4.2	2.6	3.6	3.9	4.4	3.6	3.3	3.2
28	4.8	2.7	4.4	3.6	3.4	2.4	3.75	4.5	4.2	3.55	3.25	3.4
29	4.6	.....	4.2	3.4	2.9	2.5	4.2	5.2	5.1	3.5	3.15	3.85
30	4.1	.....	5.2	3.25	2.75	2.8	4.6	8.2	5.8	3.5	3.1	3.65
31	3.85	.....	7.0	.....	2.65	.....	5.3	10.8	.....	3.5	.....	3.4

Rating table for Chattahoochee River near Norcross, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.30	1,360	3.60	2,780	4.90	4,370	7.40	7,885
2.40	1,460	3.70	2,900	5.00	4,500	7.60	8,185
2.50	1,560	3.80	3,020	5.20	4,760	7.80	8,495
2.60	1,660	3.90	3,140	5.40	5,040	8.00	8,805
2.70	1,770	4.00	3,260	5.60	5,320	9.00	10,440
2.80	1,880	4.10	3,380	5.80	5,600	10.00	12,155
2.90	1,990	4.20	3,500	6.00	5,880	11.00	13,920
3.00	2,100	4.30	3,620	6.20	6,160	12.00	15,760
3.10	2,210	4.40	3,740	6.40	6,440	13.00	17,700
3.20	2,320	4.50	3,860	6.60	6,720	14.00	19,650
3.30	2,430	4.60	3,980	6.80	7,005	15.00	21,600
3.40	2,540	4.70	4,110	7.00	7,295		
3.50	2,660	4.80	4,240	7.20	7,585		

NOTE. The above table is based on discharge measurements made during 1905-6 and is well defined.

Monthly discharge of Chattahoochee River near Norcross, Ga., for 1906.

[Drainage area, 1,170 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	20,800	1,720	4,660	3.98	4.59
February	2,840	1,770	2,100	1.79	1.86
March	20,000	1,660	4,840	4.14	4.77
April	4,630	2,210	2,750	2.35	2.62
May	3,500	1,560	2,090	1.79	2.06
June	4,500	1,460	2,050	1.75	1.95
July	8,800	1,360	3,940	3.37	3.88
August	13,600	2,100	4,520	3.86	4.45
September	8,180	2,430	4,550	3.89	4.34
October	13,900	2,660	4,670	3.99	4.60
November	5,880	2,210	2,690	2.30	2.57
December	9,440	2,100	3,020	2.58	2.97
The year	20,800	1,360	3,490	2.98	40.66

NOTE.—Values for 1906 are excellent.

CHATTAHOOCHEE RIVER AT WEST POINT, GA.

This station was established July 30, 1896. It is located at the Montgomery street wagon bridge, and is now maintained by the United States Weather Bureau. The conditions at this station and the bench marks[a] are described in Water-Supply Paper No. 168, page 84, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Chattahoochee River at West Point, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 24	F. A. Murray	458	7,360	12.91	20,100
January 24	do	344	6,880	11.92	27,100
January 25	do	408	5,690	9.20	18,100
January 26	do	399	4,530	6.14	10,300
February 15	E. C. Murphy	390	3,340	3.60	4,390
May 10	M. R. Hall	390	3,540	3.75	4,910
June 9	do	384	3,160	2.78	3,120
November 10	W. E. Hall	386	3,040	3.25	3,720

[a] The reference point is the top of the downstream end of the second iron floor beam under the bridge floor from the right-bank end of the bridge; elevation, 24.19 feet.

Daily gage height, in feet, of Chattahoochee River at West Point, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.7	4.6	3.1	6.4	3.6	3.0	2.5	6.4	7.2	6.3	3.5	3.1
2	3.6	4.4	3.1	6.4	3.5	2.8	3.0	5.1	8.2	6.2	3.45	3.25
3	5.3	4.2	3.5	5.4	3.4	2.7	2.5	4.9	5.9	7.0	3.4	3.25
4	13.1	4.0	4.2	5.0	3.7	2.8	4.0	5.2	4.9	8.5	3.4	3.25
5	12.9	4.0	3.8	4.7	4.1	3.3	3.2	6.0	4.1	9.4	3.35	3.2
6	12.2	3.9	4.1	4.6	4.1	3.2	2.8	6.8	11.2	7.6	3.35	3.25
7	12.6	4.0	3.8	4.4	4.3	2.9	2.6	4.9	9.4	5.6	3.4	3.35
8	5.7	4.0	5.6	4.3	5.5	2.8	3.1	4.1	6.1	5.3	3.3	3.3
9	4.9	3.9	8.1	4.2	4.9	2.8	6.0	4.0	4.3	5.0	3.3	3.25
10	4.6	3.9	6.4	4.5	4.1	2.6	4.3	3.9	4.7	4.4	3.3	3.3
11	4.4	3.7	5.2	4.7	3.7	2.6	4.4	3.6	4.5	4.2	3.25	4.0
12	4.3	3.7	4.5	4.4	3.5	2.6	3.9	4.3	5.7	4.0	3.25	4.4
13	4.4	3.6	4.1	4.3	3.4	4.6	3.5	3.7	4.6	3.9	3.3	5.0
14	4.4	3.6	3.9	4.0	3.3	8.5	3.8	6.2	4.2	3.8	3.3	4.1
15	4.4	3.6	7.6	4.1	3.2	8.6	7.0	8.2	3.8	3.7	3.6	3.7
16	4.2	3.6	11.6	4.1	3.2	6.8	6.8	5.6	3.5	3.7	3.55	3.5
17	4.1	3.5	11.7	4.0	3.1	5.2	7.6	6.1	3.4	3.6	3.6	3.75
18	4.1	3.4	11.0	4.1	3.0	4.6	6.5	5.2	3.3	10.6	4.5	3.8
19	4.2	3.4	11.0	3.9	3.0	3.8	8.5	5.9	3.3	12.3	5.0	5.0
20	4.1	3.4	18.9	3.8	2.95	3.6	8.6	7.5	4.0	7.8	5.1	5.6
21	4.0	3.4	17.6	3.8	2.9	3.4	6.4	6.8	7.4	6.2	5.5	5.1
22	5.4	3.4	15.1	3.8	2.5	3.15	5.1	6.4	6.5	4.7	4.6	4.7
23	11.6	3.4	9.2	3.8	3.0	3.0	5.7	5.0	5.9	4.3	4.1	4.3
24	13.4	3.3	6.0	3.5	2.8	2.8	8.0	4.3	5.3	4.0	3.6	4.1
25	9.8	3.4	5.2	3.6	2.8	2.7	5.5	4.5	5.3	3.95	3.65	3.8
26	6.6	3.4	4.9	3.7	2.8	2.6	5.6	4.0	5.4	3.85	3.5	3.6
27	5.7	3.2	4.8	3.5	3.3	3.1	5.4	3.6	4.3	3.75	3.45	3.6
28	5.4	3.2	7.2	3.1	3.4	3.1	3.9	4.2	4.5	3.55	3.4	3.65
29	5.4	.....	7.6	3.5	3.9	3.0	4.0	4.0	4.5	3.55	3.35	4.0
30	5.3	.....	6.5	3.8	3.4	2.8	4.3	5.4	5.0	3.55	3.3	4.4
31	4.9	.....	6.6	.....	3.1	.....	5.0	6.0	.....	3.5	.....	7.0

Rating table for Chattahoochee River at West Point, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.50	2,530	3.70	4,680	4.90	7,290	8.00	,900
2.60	2,680	3.80	4,880	5.00	7,520	9.00	,740
2.70	2,840	3.90	5,090	5.20	7,980	10.00	20,700
2.80	3,000	4.00	5,300	5.40	8,440	11.00	23,860
2.90	3,170	4.10	5,510	5.60	8,920	12.00	27,100
3.00	3,340	4.20	5,730	5.80	9,400	13.00	30,500
3.10	3,520	4.30	5,950	6.00	9,880	14.00	33,900
3.20	3,700	4.40	6,170	6.20	10,360	15.00	,350
3.30	3,890	4.50	6,390	6.40	10,840	16.00	40,800
3.40	4,080	4.60	6,610	6.60	11,320	17.00	44,250
3.50	4,280	4.70	6,830	6.80	11,820	18.00	47,700
3.60	4,480	4.80	7,060	7.00	12,320	19.00	51,150

NOTE.—The above table is based on discharge measurements made during 1903-1906 and is well defined.

Monthly discharge of Chattahoochee River at West Point, Ga., for 1906.

[Drainage area, 3,300 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	31,900	4,480	11,700	3.55	4.09
February	6,610	3,700	4,660	1.41	1.47
March	50,800	3,520	14,200	4.30	4.96
April	10,800	3,520	5,880	1.78	1.99
May	8,680	2,530	4,270	1.29	1.49
June	16,600	2,680	4,840	1.47	1.64
July	16,600	2,530	7,660	2.32	2.68
August	15,400	4,480	8,110	2.46	2.84
September	24,500	3,890	8,540	2.59	2.89
October	28,100	4,280	8,840	2.68	3.09
November	8,680	3,800	4,700	1.42	1.58
December	12,300	3,700	5,360	1.62	1.87
The year	50,800	2,530	7,400	2.24	30.59

NOTE.—Values are probably excellent.

SOQUE RIVER NEAR DEMOREST, GA.

This station was established July 16, 1904. It is located at Cannon Bridge, on the road from Cornelia to Acorn, 2½ miles from Demorest and about 4 miles above the mouth of the river. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 86, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Soque River near Demorest, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 23	W. E. Hall	85	394	1.16	1,080
January 23	do	85	366	3.81	905
June 27	do	84	209	2.08	242
July 27	do	84	285	2.82	488
October 1	do	85	322	3.48	790
October 2	do	88	478	5.33	1,750
October 2	do	88	487	5.37	1,770

Daily gage height, in feet, of Soque River near Demorest, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	2.65	2.2	2.75	2.5	2.2	2.05	2.85	4.4	4.4	2.55	2.4
2	2.05	2.55	2.15	2.75	2.5	2.25	2.05	2.7	3.7	5.6	2.5	2.4
3	8.2	2.5	2.25	2.7	3.0	2.3	2.05	3.0	3.0	7.5	2.5	2.4
4	5.8	2.45	2.2	2.65	2.75	2.6	2.0	2.75	6.4	3.8	2.6	2.45
5	3.6	2.4	2.2	2.7	2.5	2.3	2.1	2.7	5.2	2.5	2.6	2.4
6	3.0	2.35	2.25	2.65	2.5	2.3	3.3	2.6	3.5	2.3	2.55	2.45
7	2.4	2.35	2.2	2.65	2.85	2.2	2.45	2.75	3.2	2.35	2.55	2.45
8	2.35	2.3	3.2	2.65	2.5	2.2	3.0	2.7	2.85	3.7	2.55	2.45
9	2.5	2.3	2.5	2.8	2.4	2.2	2.85	2.6	2.8	3.5	2.55	2.5
10	2.4	2.3	2.3	2.75	2.4	2.2	2.7	2.6	4.3	3.1	2.6	2.55
11	3.0	2.25	2.25	2.7	2.4	2.25	2.95	2.65	3.8	2.8	2.6	6.1
12	2.9	2.4	2.2	2.6	2.35	5.0	2.9	2.5	3.9	2.45	2.55	4.3
13	2.7	2.3	2.25	2.55	2.35	3.2	2.65	2.4	3.6	2.35	2.55	3.0
14	2.55	2.25	2.8	2.6	2.3	2.85	2.1	2.35	2.9	2.8	2.5	2.9
15	2.45	2.25	8.1	2.9	2.25	2.8	5.0	4.8	2.85	3.1	2.5	2.85
16	2.65	2.2	3.4	2.8	2.25	2.75	2.8	3.0	2.5	3.15	2.7	2.95
17	2.55	2.2	3.1	2.75	2.2	2.55	2.8	2.8	2.35	3.9	2.65	4.8
18	2.4	2.2	3.7	2.55	2.2	2.4	4.6	[a]13.5	5.8	4.8	2.65	3.6
19	2.3	2.2	8.3	2.5	2.2	2.35	3.2	4.0	5.0	3.8	4.0	3.4
20	2.25	2.2	3.8	2.5	2.25	2.25	2.9	3.4	4.0	3.4	3.8	2.95
21	2.2	2.25	3.2	2.5	2.25	2.2	2.95	2.9	3.2	3.1	3.6	2.9
22	6.7	2.4	3.1	2.45	2.2	2.2	5.5	2.8	6.2	3.0	3.2	2.85
23	5.6	2.2	2.85	2.45	2.2	2.2	4.4	3.2	5.3	2.95	3.0	2.6
24	3.4	2.2	2.7	2.45	2.2	2.5	3.2	2.9	4.0	2.9	2.8	2.6
25	2.8	2.2	2.65	2.4	2.25	2.2	2.95	2.8	3.6	2.85	2.6	2.55
26	2.55	2.2	2.5	2.4	2.45	2.15	2.7	2.7	3.7	2.8	2.55	2.55
27	2.45	2.25	3.2	2.5	3.2	2.1	2.75	2.65	3.8	2.8	2.5	2.7
28	2.95	2.2	3.1	3.0	3.0	2.1	2.9	2.6	3.8	2.75	2.45	2.8
29	2.9	.....	3.2	2.55	2.3	2.8	2.75	8.2	3.3	2.7	2.5	2.75
30	2.7	.....	4.0	2.5	2.35	2.2	2.7	4.9	4.2	2.65	2.45	2.9
31	2.6	.....	2.85	.....	2.25	.....	3.4	6.2	.....	2.6	.....	6.2

[a] Maximum gage height 17.0 feet.

Rating table for Soque River near Demorest, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	243	3.00	568	4.00	1,000	5.80	2,070
2.10	271	3.10	606	4.20	1,100	6.00	2,220
2.20	300	3.20	645	4.40	1,200	6.20	2,370
2.30	330	3.30	685	4.60	1,310	6.40	2,520
2.40	361	3.40	725	4.80	1,420	6.60	2,680
2.50	393	3.50	770	5.00	1,540	6.80	2,840
2.60	426	3.60	815	5.20	1,665	7.00	3,000
2.70	460	3.70	860	5.40	1,795	8.00	3,880
2.80	495	3.80	905	5.60	1,930	9.00	4,780
2.90	531	3.90	950				

NOTE.—The above table is based on discharge measurements made during 1904–1906 and i defined below gage height 6 feet. Above gage height 7.4 feet the rating curve is a tangent, the diff being 90 per tenth.

Monthly discharge of Soque River near Demorest, Ga., for 1906.

[Drainage area, 112 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep in
January	4,060	257	731	6.53	
February	443	300	332	2.96	
March	4,150	286	729	6.51	
April	568	361	435	3.88	
May	645	300	374	3.34	
June	1,540	271	396	3.54	
July	1,860	243	601	5.37	
August	8,830	346	1,070	9.55	
September	2,520	346	1,010	9.02	
October	3,430	330	751	6.71	
November	1,000	377	477	4.26	
December	2,370	361	643	5.74	
The year	8,830	257	629	5.62	

NOTE.—Values can probably be considered excellent.

FLINT RIVER NEAR WOODBURY, GA.

Measurements of the flow of Flint River were made during 1897 1898 at Molina, Ga., but the river bed was so shifting that the sta was discontinued June 2, 1898. Measurements were made in 189 the Macon and Birmingham Railroad bridge, near Woodbury, Ga miles below the Molina station. March 29, 1900, a gage was pu near this bridge and the station was reestablished. Gage readings furnished by the U. S. Weather Bureau. The conditions at this tion and the bench marks are described in Water-Supply Paper 168, page 90, and in Water-Supply Paper No. 197, where are gi also data for previous years.

Discharge measurements of Flint River near Woodbury, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	D cha
		Feet.	*Sq. ft.*	*Feet.*	*Se*
February 10	W. E. Hall	273	1,070	1.40	
April 12	F. A. Murray	287	1,080	1.22	
May 29	do	282	894	.52	
June 18	do	290	1,360	2.13	
September 11	do	283	1,040	1.06	
November 15	W. E. Hall	253	898	.93	

Daily gage height, in feet, of Flint River near Woodbury, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.3	1.6	0.8	2.5	0.5	0.3	0.2	1.3	0.9	1.6	0.6	0.7
2	1.3	1.5	.9	2.1	.5	.3	1.0	1.0	.9	2.1	.7	.7
3	1.7	1.4	1.1	1.8	.5	.3	.4	1.0	1.3	2.6	.7	.7
4	4.5	1.2	1.5	1.6	.8	.4	.1.5	1.1	.9	2.6	.6	.7
5	4.7	1.2	1.4	1.4	1.2	.6	1.0	3.5	.8	2.2	.6	.6
6	4.9	1.2	1.1	1.3	1.1	.5	.6	3.3	3.6	3.0	.6	.7
7	4.0	1.3	1.0	1.2	1.0	.3	.4	1.9	2.7	2.3	.6	.6
8	2.9	1.4	1.9	1.2	1.4	.2	.5	1.7	1.1	1.6	.6	.7
9	2.0	1.5	3.2	1.2	1.3	.2	1.3	1.7	.8	1.0	.5	.8
10	1.7	1.5	3.2	1.5	1.1	.5	1.5	1.3	1.2	.8	.6	.8
11	1.5	1.4	2.8	1.4	.9	.3	1.0	1.1	1.0	.7	.6	.9
12	1.7	1.2	2.2	1.3	.8	.2	3.6	1.2	1.0	.6	.6	1.0
13	1.8	1.2	1.8	1.1	.6	4.3	2.3	1.2	1.4	.6	.6	1.0
14	1.8	1.2	1.5	1.0	.6	5.9	1.6	2.1	1.3	.5	.5	.9
15	1.7	1.3	2.8	1.3	.5	6.2	1.8	2.9	.8	.5	.9	.9
16	1.5	1.2	3.9	1.2	.5	6.2	1.5	3.5	.6	.5	1.0	.8
17	1.4	1.1	3.9	1.0	.4	4.5	1.2	2.1	.5	.5	.9	.8
18	1.3	1.0	3.5	.9	.4	2.5	1.2	1.0	.4	1.3	1.7	1.1
19	1.3	1.0	3.0	.9	.4	1.7	2.3	1.2	.8	3.8	2.4	1.2
20	1.3	1.0	7.5	.8	.3	1.7	2.1	.8	1.4	3.1	2.0	1.6
21	1.3	1.0	7.8	.8	.4	1.2	1.7	.6	1.1	2.9	1.7	1.7
22	2.7	1.1	7.3	.8	.4	.8	1.1	.8	1.8	1.8	1.3	1.6
23	4.7	1.1	5.2	.7	.4	.7	2.6	1.7	1.6	1.5	1.1	1.3
24	6.3	1.0	2.9	.7	.4	.6	3.1	2.7	1.5	1.2	1.0	1.1
25	5.6	1.0	2.1	.6	.3	.5	2.5	1.2	1.4	1.0	.9	1.0
26	3.7	.9	1.7	.6	.4	.4	1.7	.9	1.5	.9	.8	.9
27	3.0	.9	1.6	.6	.6	.4	1.8	1.1	1.2	.9	.8	.8
28	2.6	.9	2.3	.6	.6	.4	1.7	1.8	1.0	.8	.8	.9
29	2.3	.....	3.1	.5	.5	.3	1.1	1.5	1.0	.7	.7	1.2
30	2.0	.....	3.6	.6	.5	.3	1.7	3.0	.8	.7	.7	1.4
31	1.8	.....	2.9	.....	.4	.....	1.4	1.4	.....	.7	.....	2.2

Rating table for Flint River near Woodbury, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.00	280	1.10	1,050	2.20	2,220	3.60	4,160
.10	320	1.20	1,140	2.30	2,340	3.80	4,480
.20	370	1.30	1,230	2.40	2,460	4.00	4,800
.30	420	1.40	1,320	2.50	2,590	4.20	5,140
.40	480	1.50	420	2.60	2,720	4.40	5,480
.50	540	1.60	520	2.70	2,860	4.60	5,820
.60	610	1.70	630	2.80	3,000	4.80	6,160
.70	690	1.80	740	2.90	3,140	5.00	6,520
.80	780	1.90	1,860	3.00	3,280	6.00	8,450
.90	870	2.00	1,980	3.20	3,560	7.00	10,750
1.00	960	2.10	2,100	3.40	3,850	8.00	13,250

TE.—The above table is based on discharge measurements made during 1904–1906, and is fairly well ed below gage height 5 feet.

Monthly discharge of Flint River near Woodbury, Ga., for 1906.

[Drainage area, 990 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft per sq. mile.	Depth in inches.
ary	9,100	1,230	2,950	2.98	3.44
uary	1,520	870	1,130	1.14	1.19
	12,800	780	3,520	3.56	4.10
	2,590	540	1,080	1.09	1.22
	1,320	420	663	.670	.77
	8,880	370	1,810	1.83	2.04
	4,160	370	1,540	1.56	1.80
st	4,000	610	1,690	1.71	1.97
mber	4,160	480	1,210	1.22	1.36
ber	4,480	540	1,500	1.52	1.75
mber	2,460	540	893	.902	1.01
mber	2,220	610	978	.988	1.14
The year	12,800	370	1,580	1.60	21.79

TE.—*Values for 1906 are excellent.*

FLINT RIVER NEAR MONTEZUMA, GA.

This station is located at the iron highway bridge about 1 mile w of Montezuma, Ga. Some discharge measurements had already be made at this point when the United States Weather Bureau esta lished a standard chain gage on the bridge, late in 1904. During 19 the daily gage heights have been furnished by the Weather Bure The conditions at this station and the bench marks are described Water-Supply Paper No. 168, page 92, and in Water-Supply Pap No. 197, where are given also data for previous years.

Discharge measurements of Flint River near Montezuma, Ga., in 1901–1906

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis charg
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-*
1901.					
July 18	F. A. Murray	173	1,980	4.38	2.
1904.					
September 21	J. M. Giles	188	1,300	1.85	
1905.					
August 23	F. A. Murray	198	1,550	3.15	1.
August 31	do	198	1,390	2.41	1.
October 12	W. E. Hall	195	1,330	2.25	1.
1906.					
April 11	W. E. Hall	202	2,200	6.38	3,
June 16	F. A. Murray	225	3,260	11.92	8,
November 30	W. E. Hall	196	1,490	3.94	1,

Daily gage height, in feet, of Flint River near Montezuma, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	6.5	8.5	4.9	11.8	3.4	2.8	3.0	5.4	8.8	4.5	2.9	
2	6.3	7.6	4.9	10.0	3.4	2.8	3.0	5.6	6.6	4.4	2.9	
3	6.2	7.0	5.1	8.1	3.4	2.7	3.6	5.5	5.4	7.2	2.8	
4	7.4	6.7	5.7	7.0	3.5	2.7	3.5	5.3	5.3	10.0	2.8	
5	10.4	6.3	5.6	6.9	4.0	2.7	3.4	5.0	5.5	11.9	2.8	
6	12.4	6.1	5.5	6.8	4.4	2.9	4.0	4.6	5.1	12.4	2.8	
7	13.0	5.9	5.4	6.6	5.2	3.2	3.8	4.4	5.6	12.0	2.8	
8	13.4	6.0	5.6	6.4	6.0	3.0	3.4	4.1	10.3	10.2	2.7	
9	12.0	6.5	6.7	6.2	6.4	2.9	3.2	8.0	11.4	9.0	2.7	
10	11.4	7.5	8.5	6.4	6.2	2.6	6.3	6.5	11.7	8.0	2.7	
11	10.6	8.0	8.0	6.6	5.6	2.5	6.9	6.0	9.0	6.5	2.9	
12	8.0	7.7	7.6	6.7	4.8	2.5	5.5	6.0	7.0	5.8	3.1	
13	7.0	7.0	7.0	6.6	4.2	3.0	5.0	5.5	6.0	5.0	3.3	
14	6.9	6.5	7.4	6.3	3.8	3.8	8.4	6.0	5.5	4.6	3.5	
15	7.2	6.4	6.6	6.4	3.5	8.8	8.6	5.8	7.5	4.4	3.8	
16	7.0	6.2	6.0	6.6	3.2	10.6	7.6	7.0	5.7	4.2	4.6	
17	6.9	6.0	6.0	6.4	3.1	11.9	6.4	7.8	5.0	4.0	5.0	
18	6.8	5.7	9.0	6.0	3.0	12.6	6.0	7.0	4.8	3.7	5.5	
19	6.8	5.7	9.6	5.6	2.8	13.0	5.9	6.7	4.7	3.6	5.8	
20	6.4	5.7	10.5	5.0	2.7	12.1	6.7	6.0	4.4	7.3	5.6	
21	6.0	5.7	10.8	4.5	2.7	10.0	7.0	5.0	4.0	7.8	6.0	
22	6.1	5.7	12.0	4.2	2.6	8.0	7.2	4.4	5.8	9.7	6.6	
23	11.4	6.6	13.7	4.0	2.5	7.0	6.4	6.0	5.4	7.7	6.0	
24	12.2	6.0	14.4	3.8	2.7	6.1	6.0	6.9	4.6	5.0	5.5	
25	14.2	5.7	13.8	3.6	3.0	5.6	9.3	7.5	4.0	4.0	5.2	
26	15.0	5.4	12.1	3.5	3.1	5.0	10.0	7.2	4.0	3.5	4.6	
27	14.3	5.2	9.0	3.5	3.4	4.4	9.6	6.5	4.0	3.3	4.0	
28	12.0	5.0	7.8	3.5	3.4	3.6	8.4	6.0	4.4	3.2	3.8	
29	11.6	.....	6.8	3.5	3.2	3.4	7.0	5.6	5.0	3.1	3.7	
30	9.8	.....	6.4	3.4	3.0	3.2	6.6	5.4	4.7	3.0	3.7	
31	10.0	.....	8.0	.....	2.9	.....	6.0	8.0	.....	3.0	.....	

Rating table for Flint River near Montezuma, Ga., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	640	2.40	1,215	3.80	1,900	6.40	3,550
1.10	675	2.50	1,260	3.90	1,955	6.60	3,660
1.20	710	2.60	305	4.00	2,010	6.80	3,840
1.30	750	2.70	,350	4.20	2,120	7.00	3 990
1.40	790	2.80	,400	4.40	2,240	8.00	4,750
1.50	830	2.90	450	4.60	2,360	9.00	5,570
1.60	870	3.00	,500	4.80	3,480	10.00	6,420
1.70	910	3.10	,550	5.00	2,600	11.00	7,300
1.80	950	3.20	1,600	5.20	2,725	12.00	8,200
1 90	990	3.30	1,650	5.40	2,855	13.00	9,160
2.00	1,035	3.40	1,700	5.60	2,990	14.00	10,200
2.10	1,080	3.50	1,750	5.80	3,130	15.00	11,270
2.20	1,125	3.60	1,800	6.00	3,270	16.00	12,400
2.30	1,170	3.70	1,850	6.20	3,410	17.00	13,530

E.—The above table is based on discharge measurements made during 1901–1906, and is well l between gage heights 1.8 feet and 6 feet.

Monthly discharge of Flint River near Montezuma, Ga., for 1905–6.

[Drainage area, 2,700 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
ry	4,440	1,600	2,230	0.826	0.95
ary	13,900	1,600	5,930	2.20	2.29
	5,230	2,300	3,200	1.19	1.37
	5,150	1,850	2,480	.918	1.02
	3,690	1,600	2,470	.915	1.05
	2,010	1,040	1,350	.500	.56
	4,360	950	1,770	.656	.76
st	4,910	750	2,250	.833	.96
mber	2,360	640	1,140	.422	.47
er	2,060	950	1,280	.474	.55
mber	2,420	990	1,430	.530	.59
nber	10,100	1,170	4,910	1.82	2.10
The year	13,900	640	2,540	.940	12.67
1906.					
ary	11,300	3,270	6,170	2.29	2.64
ary	5,150	2,600	3,540	1.31	1.36
	10,600	2,540	4,970	1.84	2.12
	8,020	1,700	3,280	1.21	1.35
	3,550	1,260	1,900	.704	.81
	9,160	1,260	3,270	1.21	1.35
	6,420	1,500	3,420	1.27	1.46
st	4,750	2,060	3,310	1.23	1.42
mber	7,930	2,010	3,430	1.27	1.42
er	8,580	1,500	3,620	1.34	1.54
mber	3,690	1,350	2,070	.767	.86
nber	4,440	1,750	2,310	.856	.99
The year	11,300	1,260	3,440	1.27	17.32

E.—Values for 1905 and 1906 are excellent.

FLINT RIVER AT ALBANY, GA.

his station was originally established by the United States ather Bureau April 10, 1893, and has been maintained from that to the present. Discharge measurements by the Geological vey were begun in 1901, and the gage-height records furnished he Weather Bureau have been used, except for a portion of the

year 1903. The present observer, D. W. Brosnan, is paid by t Weather Bureau. Discharge measurements are made from t bridge of the Georgia Northern Railroad. The conditions at tl station and the bench marks are described in Water-Supply Pa No. 168, page 94, and in Water-Supply Paper No. 197, where are giv also data for previous years.

Discharge measurements of Flint River at Albany, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis char
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-*
February 12	W. E. Hall	134	2,960	9.62	13
February 13	do	288	3,660	9.06	12
April 14	do	122	2,640	4.90	6
June 14	F. A. Murray	122	2,400	3.64	5
August 13	W. E. Hall	118	2,490	3.35	4
November 28	do	115	2,350	2.33	3

Daily gage-height, in feet, of Flint River at Albany, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	7.9	14.1	4.6	7.9	1.8	2.7	2.0	5.8	5.1	2.8	2.2	
2	7.3	11.6	4.3	9.1	1.8	2.4	1.9	5.4	5.0	2.7	2.0	
3	6.9	9.0	5.1	10.4	1.7	1.9	2.1	5.0	6.1	2.7	2.0	
4	7.9	7.5	6.4	10.2	1.7	1.8	2.5	4.9	5.0	3.7	1.9	
5	8.6	6.5	7.2	8.8	3.1	1.7	2.5	4.6	4.2	5.8	1.8	
6	10.2	6.1	8.0	7.1	4.2	1.6	2.8	3.8	4.0	6.9	1.8	
7	10.5	5.8	7.9	6.0	5.1	1.9	2.8	3.2	4.0	8.5	1.8	
8	11.1	6.2	7.7	5.3	6.4	2.1	2.7	4.2	5.3	9.3	1.8	
9	12.0	6.8	7.7	4.9	7.2	1.8	2.8	5.1	7.6	9.7	1.8	
10	12.7	7.3	7.9	4.6	7.1	1.2	2.9	5.6	9.7	9.0	1.7	
11	12.9	9.2	8.5	4.5	6.3	1.5	5.0	5.8	10.2	7.7	1.7	
12	12.5	9.7	8.9	4.5	5.5	1.4	5.6	4.8	9.9	6.5	1.6	
13	11.2	9.3	9.1	4.8	4.6	2.0	5.8	3.6	7.8	4.2	1.6	
14	8.8	8.9	9.2	4.9	3.8	3.3	6.5	3.4	6.0	2.5	1.5	
15	7.9	7.9	8.8	4.7	3.1	4.9	7.6	3.6	4.5	2.2	1.8	
16	7.6	7.0	8.1	4.5	2.6	7.3	7.9	3.5	4.5	2.0	2.0	
17	7.1	6.6	6.7	4.5	2.3	9.5	8.1	4.0	4.4	2.0	2.1	
18	6.7	6.4	6.2	4.4	2.3	10.4	8.3	5.3	4.3	2.1	3.0	
19	6.3	6.0	6.2	4.3	2.2	10.4	8.4	5.5	3.5	2.1	3.5	
20	6.0	5.5	8.0	3.9	2.2	10.6	7.7	5.7	2.6	2.0	3.1	
21	5.8	5.2	9.0	3.5	2.1	11.1	7.4	5.9	2.0	3.4	2.9	
22	6.2	5.6	10.4	3.3	2.2	11.4	7.3	5.3	1.7	4.8	3.5	
23	8.1	5.9	10.8	3.2	2.5	10.4	7.0	4.3	2.3	6.7	4.3	
24	13.2	6.4	11.2	2.9	2.6	8.0	6.4	4.1	3.6	7.1	4.0	
25	17.0	6.3	12.1	2.6	2.6	5.2	5.7	5.3	3.7	6.7	3.6	
26	17.5	6.0	13.1	2.5	2.8	3.5	6.2	6.1	3.4	5.5	3.3	
27	18.1	5.5	13.7	2.4	3.7	2.8	7.0	6.2	3.1	3.7	2.6	
28	18.0	5.0	13.6	2.3	4.2	2.5	7.4	5.5	3.1	3.2	2.4	
29	17.1	.....	12.2	2.1	4.5	2.4	7.8	5.3	3.0	2.8	2.2	
30	16.8	.....	9.0	1.9	4.0	2.6	7.2	5.0	3.0	2.5	2.1	
31	15.9	.....	8.0	.....	3.4	.....	6.2	4.6	.....	2.4	.....	

Discharge measurements of Kinchafoonee Creek near Leesburg, Ga., in 1905–1907

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Di chai
		Feet.	*Sq. ft.*	*Feet.*	*Sec.*
1905.					
August 30	F. A. Murray	90	180	0.98	
October 13	W. E. Hall	90	238	1.70	
1906.					
February 14	W. E. Hall	130	759	6.67	1
April 13	do	115	438	3.87	
June 15	F. A. Murray	152	888	6.94	1
November 29	W. E. Hall	105	333	2.44	
1907.					
January 19	M. R. Hall	107	342	2.72	

Daily gage height, in feet, of Kinchafoonee Creek near Leesburg, Ga., for 1906.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1		2.0	2.3	2.5	3.8	3.5	2.8	2.5	
2		2.0	2.1	2.4	3.6	3.3	3.4	2.5	
3		1.9	1.9	2.5	3.5	3.1	4.1	2.5	
4		2.0	1.8	2.7	3.1	2.9	5.2	2.7	
5		3.6	2.0	2.9	2.7	2.8	5.0	2.9	
6		5.0	2.3	3.0	2.5	3.4	5.1	2.7	
7		5.5	2.5	2.9	2.7	5.6	5.2	2.5	
8		6.0	2.1	2.8	2.9	7.7	5.3	2.3	
9		6.5	1.4	3.0	3.3	10.5	4.9	2.3	
10		5.9	1.1	3.6	2.3	9.7	4.5	2.2	
11		4.8	1.0	4.5	2.0	7.1	3.9	2.2	
12	3.8	4.6	2.3	5.9	2.1	4.4	3.0	2.2	
13	3.8	3.7	4.1	7.1	2.2	3.8	2.3	2.1	
14	3.8	2.9	5.6	8.2	2.3	3.1	2.1	2.0	
15	3.7	2.7	7.2	6.8	2.5	2.9	2.0	2.5	
16	3.8	2.5	11.5	5.1	2.6	2.7	1.9	2.9	
17	3.9	2.3	10.0	5.2	2.6	2.5	1.8	3.1	
18	3.8	2.2	8.6	5.8	2.5	2.3	1.9	3.3	
19	3.4	2.5	7.8	5.3	2.2	2.2	2.6	3.4	
20	2.9	2.4	7.2	4.9	1.9	2.1	3.5	3.5	
21	2.7	2.3	7.1	4.7	1.7	2.0	4.7	3.5	
22	2.6	2.2	7.3	4.9	1.7	1.8	6.3	3.3	
23	2.5	2.1	5.5	5.1	2.8	1.9	7.8	3.1	
24	2.5	2.2	4.6	4.3	3.1	2.0	6.5	2.8	
25	2.3	2.7	3.7	3.9	3.5	1.8	4.9	2.7	
26	2.2	3.4	3.3	3.6	3.4	1.6	3.4	2.6	
27	2.1	3.9	2.9	3.1	3.3	1.8	2.9	2.5	
28	2.1	4.5	2.8	3.0	3.4	2.0	2.8	2.5	
29	2.1	4.3	2.7	3.6	3.5	2.1	2.7	2.4	
30	2.0	3.6	2.6	4.5	3.7	2.3	2.7	2.4	
31		2.5		4.1	3.6		2.6		

Rating table for Kinchafoonee Creek near Leesburg, Ga., for 1905–6.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.60	164	2.00	380	3.40	638	5.60	1,189
.70	177	2.10	397	3.50	658	5.80	1,251
.80	191	2.20	414	3.60	679	6.00	1,315
.90	205	2.30	432	3.70	700	6.20	1,381
1.00	220	2.40	450	3.80	721	6.40	1,447
1.10	235	2.50	468	3.90	743	6.60	1,515
1.20	250	2.60	486	4.00	765	6.80	1,583
1.30	266	2.70	504	4.20	811	7.00	1,653
1.40	282	2.80	522	4.40	859	8.00	2,015
1.50	298	2.90	541	4.60	909	9.00	2,400
1.60	314	3.00	560	4.80	961	10.00	2,800
1.70	330	3.10	579	5.00	1,015	11.00	3,200
1.80	346	3.20	598	5.20	1,071		
1.90	363	3.30	618	5.40	1,129		

NOTE.—The above table is based on seven discharge measurements made during 1905–1907 and i defined below gage height 4 feet.

Monthly discharge of Kinchafoonee Creek near Leesburg, Ga., for 1905-6.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
1905.			
ber	298	164	211
r	560	250	328
ber	522	250	311
1906.			
12-30)	743	380	556
	1,480	363	668
	3,400	220	969
	2,090	450	870
	721	330	528
ber	3,000	314	754
r	1,940	346	768
ber	658	380	500
ber	1,020	414	548

:—Values for 1905 and 1906 are excellent.

ICHAWAYNOCHAWAY CREEK AT MILFORD, GA.

is station is located at the wagon bridge at Milford, Ga. When established, on August 29, 1905, the bridge was an old wooden ture, which was shortly afterwards replaced by a new steel re, with one span of 110 feet, with short trestle approaches at both . The temporary vertical gage was also replaced by a standard gage, attached to the downstream side of the new bridge; length ain, 23.46 feet. The observer is W. J. Kidd.

e current is moderately swift and is broken by old bridge timbers remaining in the channel. The station is about 100 feet above emains of an old wooden dam, which retains the water at a higher than it would otherwise have. Gage heights for 1905 and 1906 rom the chain gage described above, but future records will be a gage located below the dam.

scharge measurements of Ichawaynochaway Creek at Milford, Ga., in 1905-1907.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
t 29	F. A. Murray	111	458	2.89	364
r 16	W. E. Hall	116	452	3.05	386
906.					
ry 15	W. E. Hall	137	666	4.65	1,390
8	do	123	574	3.78	715
8	do	123	574	3.76	693
	F. A. Murray	144	718	4.80	1,770
14	W. E. Hall	12	555	3.45	726
ber 26	do	125	493	3.46	592
907.					
y 22	M. R. Hall	120	496	3.56	690
y 22	do	120	499	3.57	705

Daily gage height, in feet, of Ichawaynochaway Creek at Milford, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	4.4	4.9	4.1	4.3	3.1	3.7	3.9	3.4	4.4	3.5	3.2
2	4.4	4.8	4.05	4.2	3.1	3.6	3.8	3.35	4.1	3.7	3.25
3	4.6	4.7	4.0	4.1	3.3	3.5	3.7	3.3	4.1	4.0	3.25
4	5.0	4.6	4.0	4.05	3.5	3.4	3.6	3.3	4.2	4.4	3.25
5	5.6	4.5	4.2	4.0	4.0	3.3	3.5	3.2	4.3	4.8	3.3
6	6.0	4.5	4.8	3.9	4.8	3.2	3.5	3.2	4.2	4.7	3.3
7	5.8	4.6	5.4	3.8	5.3	3.25	3.6	3.3	4.0	4.3	3.3
8	5.2	4.7	5.0	3.9	5.8	3.3	3.8	3.3	4.1	4.0	3.3
9	4.8	5.0	4.6	4.0	6.3	3.3	4.0	3.2	4.2	3.7	3.3
10	4.7	5.3	4.5	4.05	5.6	3.35	4.1	3.2	4.3	3.5	3.3
11	4.6	5.5	4.4	4.1	5.3	3.4	4.4	3.3	4.05	3.4	3.3
12	4.45	5.2	4.3	4.0	4.6	3.45	4.8	3.4	3.9	3.3	3.3
13	4.3	5.0	4.35	3.9	4.1	4.5	5.2	3.35	3.7	3.2	3.35
14	4.2	4.9	4.4	3.8	3.7	10.9	5.0	3.35	3.5	3.1	3.4
15	4.0	4.8	4.45	3.8	3.55	11.6	4.6	3.4	3.4	3.0	3.4
16	4.0	4.7	4.35	3.8	3.4	11.5	4.4	3.45	3.3	2.9	3.4
17	4.0	4.6	4.3	3.85	3.3	8.6	4.4	3.5	3.3	3.2	4.5
18	3.9	4.5	4.35	3.8	3.2	6.7	6.2	3.45	3.25	3.6	4.55
19	3.9	4.4	4.4	3.7	3.1	5.1	5.8	3.45	3.2	3.7	4.5
20	4.0	4.35	4.4	3.65	3.1	4.7	5.2	3.5	3.1	3.8	4.55
21	4.1	4.35	4.45	3.6	3.2	4.6	4.6	3.6	3.1	3.8	4.6
22	4.8	4.4	4.45	3.55	3.3	4.5	4.2	3.7	3.0	3.7	4.7
23	6.8	4.45	4.45	3.5	3.4	4.35	4.0	3.8	3.0	3.3	4.6
24	10.3	4.45	4.5	3.45	3.7	4.3	3.9	4.1	2.9	3.2	4.5
25	10.9	4.4	4.5	3.4	4.1	4.1	3.8	4.5	2.9	3.0	4.4
26	8.0	4.3	4.5	3.35	4.4	3.9	3.7	4.3	3.0	3.1	4.4
27	6.5	4.2	4.45	3.3	4.5	3.65	3.6	4.2	3.2	3.2	4.35
28	6.0	4.15	4.45	3.25	4.55	3.5	3.6	4.0	3.35	3.2	4.3
29	5.5	.....	4.4	3.2	4.6	3.4	3.55	3.85	3.5	3.3	4.3
30	5.3	.....	4.35	3.15	4.4	3.6	3.5	3.6	3.5	3.3	4.3
31	5.1	.....	4.3	.....	3.9	.....	3.4	3.9	.....	3.2	.....

Rating table for Ichawaynochaway Creek at Milford, Ga., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.40	170	3.30	540	4.20	1,120	6.00	2,800
2.50	200	3.40	595	4.30	1,200	7.00	3,800
2.60	235	3.50	650	4.40	1,280	8.00	4,800
2.70	270	3.60	710	4.50	1,360	9.00	5,800
2.80	310	3.70	770	4.60	445	10.00	6,800
2.90	350	3.80	835	4.70	1,530	11.00	7,800
3.00	395	3.90	900	4.80	1,620		
3.10	440	4.00	970	4.90	1,710		
3.20	490	4.10	1,045	5.00	1,800		

NOTE.- The above table is based on ten discharge measurements made during 1905-1907 and i well defined.

Monthly discharge of Ichawaynochaway Creek at Milford, Ga., for 1905–6.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
1905.			
September	395	185	270
October	770	395	539
November	710	395	516
December	2,800	350	1,130
1906.			
January	7,700	900	2,190
February	2,300	1,080	1,500
March	2,200	970	1,310
April	1,200	465	814
May	3,100	440	1,110
June	8,400	490	1,840
July	3,000	595	1,150
August	1,360	490	703
September	1,280	350	742
October	1,620	350	711
November	1,530	490	913
December	1,530	595	976
The year	8,400	350	1,160

NOTE.—Values for 1905 and 1906 good.

MISCELLANEOUS MEASUREMENTS IN APALACHICOLA RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in Apalachicola River drainage basin during 1906:

Chattahoochee River near Vinings, Ga.—Measurements were made at a new iron highway bridge 1 mile east of Vinings, Ga., and about 10 miles northwest of Atlanta, Ga. It is about 10 miles below the developed power at Bull Sluice. The bench mark is the top of the upstream end of the second floor beam from the left bank; elevation, 31 feet above the datum of the assumed gage.

June 8: Width, 258 feet; area, 1,140 square feet; gage height, 4.72 feet; discharge, 2,080 second-feet.

August 8: Width, 259 feet; area, 1,280 square feet; gage height, 5.72 feet; discharge, 3,620 second-feet.

Red Oak Creek near Woodbury, Ga.—This stream enters Flint River from the right, 5 miles above the regular gaging station, on Flint River near Woodbury, Ga. A measurement was made May 29, 1906, at a wooden wagon bridge about 1 mile above the mouth of the creek. The bench mark is the top of the first post from the right bank edge, downstream side, 15 feet from a large white oak tree; elevation 20 feet above the datum of the assumed gage.

Width, 62 feet; area, 157 square feet; gage height, 3.31 feet; discharge, 75 second-feet.

Big Potato Creek near Thomaston, Ga.—A measurement was made May 30, 1906, at a covered wagon bridge 2½ miles west of Thomaston, Ga. The bench mark is the top of the downstream lower stringer,

at a point 80 feet from the left end of the bridge; elevation 15 feet above the datum of the assumed gage.

Width, 81 feet; area, 182 square feet; gage height, 3.07 feet; discharge, 97 second-feet.

Another measurement was made May 30, 1906, at the highway bridge about 5 miles southwest of Thomaston, Ga., 200 yards above Daniel's old gristmill. The bench mark is a chisel mark on the intermediate post at the downstream end of the second floor beam; elevation, 28 feet above the datum of the assumed gage.

Width, 84 feet; area, 144 square feet; gage height, 2.07 feet; discharge, 101 second-feet.

Muckalee Creek near Leesburg, Ga.—A measurement was made June 15, 1906, about 3 miles east of Leesburg, Ga., at a wooden highway bridge consisting of two truss spans, with trestle approaches about 50 feet each. The bench mark is the top of the upstream end of the wooden cap of the middle bent of the bridge; elevation, 17 feet above the datum of the assumed gage.

Width, 83 feet; area, 624 square feet; gage height, 7.02; discharge, 1,160 second-feet.

Spring Creek near Bainsbridge, Ga.—A measurement was made February 16, 1906, at a steel wagon bridge on the road to Fairchilds, Ga. The bench mark is the top of the downstream end of the second floor beam from the right-bank pier; elevation, 20 feet above the datum of the assumed gage.

Width, 169 feet; area, 1,040 square feet; gage height, 8.45 feet; discharge, 2,110 second-feet.

CHOCTAWHATCHEE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Choctawhatchee River drains the southeastern part of Alabama and that portion of Florida lying immediately south. The main river rises in Barbour County, Ala., a short distance west of Eufaula, Ala., and flows in a southwesterly and southerly direction through Choctawhatchee Bay to the Gulf of Mexico. Pea River is the principal tributary and enters from the west at Geneva, Ala. This branch is the longer of the two above the junction, having its head in Bullock County, near Union Springs, Ala. Double Bridges Creek is an important but small tributary lying between the main branches and entering Choctawhatchee River just above the mouth of Pea River. These are all moderately swift streams, even at low water, and at places the fall is sufficient to make considerable shoals or rapids and offer practicable sites for waterpower developments.

CHOCTAWHATCHEE RIVER NEAR NEWTON, ALA.

This station was established in June, 1906, and is located at the steel highway bridge about 1 mile north of Newton and the same dis-

tance from Elba Junction. Gage-height records have been maintained for a portion of the time only, as it has been difficult to keep an observer. The current is swift and the main portion of the section is deep, it having been excavated for boating. Both banks are high and not liable to overflow.

A standard chain gage is attached to the downstream side of the bridge; length of chain, 45.76 feet. The reference point is the top of the ½-inch rod, the top rod of the bridge fencing on the downstream side, at the third intermediate post from the left end of the bridge; elevation, 45 feet.

Discharge measurements of Choctawhatchee River near Newton, Ala., in 1906-7.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1906		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 21	W. E. Hall	115	291	4.40	1,260
June 11	F. A. Murray	96	574	3.08	416
August 15	W. E. Hall	111	259	3.98	867
September 20	F. A. Murray	98	106	2.71	312
1907					
January 23	M. R. Hall	113	198	3.76	747

Daily gage height, in feet, of Choctawhatchee River near Newton, Ala., for 1906.

Day.	June.	July.	Aug.	Sept.	Oct.	Day.	June.	July.	Aug.	Sept.	Oct.
1		3.6	3.5	2.8	4.5	17	4.4	4.5	3.1	2.5	
2		4.5	3.1	2.8	5.0	18	4.1	4.5	3.2	2.5	
3		3.4	2.9	2.8	5.1	19	3.8	4.5	2.8	2.7	
4		3.2	2.7	2.8	5.1	20	3.2	4.3	2.5	2.9	
5		3.2		2.3	4.3	21	3.1	3.6	2.5	3.3	
6		3.2		2.3	5.0	22	2.85	3.5	2.5	3.9	
7		3.1		3.0	5.0	23	2.8	3.2	2.8	3.5	
8		2.7		3.8	4.9	24	2.7	3.3	3.0	3.0	
9		3.2		4.1	4.7	25	2.7	3.5	3.9	3.0	
10		3.3		4.3	4.3	26	2.7	3.8	3.3	3.0	
11	3.1	3.7		5.0	4.0	27	3.1	4.3	3.1	3.0	
12	3.3	4.6	2.7	4.3	4.0	28	3.1	4.5	3.1	4.1	
13	3.4	4.9	2.7	4.1	3.9	29	3.0	4.5	2.8	4.8	
14	3.5	4.5	3.3	3.1		30	3.2	3.7	2.8	4.7	
15	4.2	4.5	3.5	3.0		31		3.5	2.8		
16	4.5	4.5	3.9	2.5							

Rating table for Choctawhatchee River near Newton, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.50	270	3.20	455	3.90	830	4.60	1,485
2.60	290	3.30	495	4.00	900	4.70	1,610
2.70	310	3.40	540	4.10	975	4.80	1,740
2.80	335	3.50	590	4.20	1,060	4.90	1,880
2.90	360	3.60	645	4.30	1,155	5.00	2,020
3.00	390	3.70	705	4.40	1,255		
3.10	420	3.80	765	4.50	1,365		

NOTE.—The above table is based on five discharge measurements made during 1906-7, and is well defined.

PEA RIVER AT ELBA, ALA.

This station, located at the railroad bridge of the Atlantic Cc Line, was established on June 8, 1906. The bridge is in the to about 800 feet from the station. Measurements are made from downstream side of the bridge and its trestle approaches. The c rent is moderately swift, and the bed is rocky and rough.

The standard chain gage is attached to the downstream guard r length of chain, 52.21 feet. Gage readings are furnished by the I River Power Company. The bench mark is the top of the dow stream end of the second floor beam from the right bank; elevati 48.47 feet above gage datum.

Discharge measurements of Pea River at Elba, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Di char
		Feet.	*Sq. ft.*	*Feet.*	*Sec.*
February 21	W. E. Hall	125	438	4.10	1
September 15	F. A. Murray	116	191	3.20	
September 17	do	116	172	3.10	
September 18	do	115	169	3.10	

Daily gage height, in feet, of Pea River at Elba, Ala., for 1906.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	De
1		4.1	3.55	3.3	8.4	3.6	
2		3.65	3.4	3.3	7.5	3.6	
3		4.5	3.4	3.2	7.9	3.5	
4		3.85	3.85	3.1	6.2	3.5	
5		3.55	3.55	3.1	5.5	3.5	
6		3.3	3.55	3.55	6.1	3.5	
7		3.2	3.65	3.55	6.8	3.5	
8	3.55	3.2	3.4	3.55	5.4	3.5	
9	3.4	3.65	3.3	4.3	4.8	3.5	
10	3.55	6.6	3.3	3.55	4.7	3.5	
11	3.75	4.6	4.2	3.55	4.4	3.4	
12	3.75	5.6	6.6	3.4	4.2	3.6	
13	3.65	6.6	5.0	3.3	4.2	3.55	
14	3.95	6.6	5.2	3.2	4.0	4.6	
15	4.3	7.6	5.5	3.2	3.8	4.3	
16	3.95	6.6	4.7	3.1	3.7	4.0	
17	5.3	7.6	4.3	3.0	3.6	4.1	
18	4.5	5.6	3.95	3.0	3.7	[b] 7.0	
19	3.95	5.1	3.85	2.9	3.9	[b] 10.0	
20	3.85	5.1	3.65	2.9	4.0	5.9	
21	3.65	5.0	3.4	3.1	4.1	6.0	
22	3.4	4.9	3.55	3.3	4.4	6.0	
23	3.2	4.5	3.4	3.3	4.3	5.6	
24	3.2	4.4	3.4	3.2	4.2	5.4	
25	3.1	4.1	3.3	3.2	4.1	5.3	
26	3.3	3.75	3.3	3.2	4.0	5.0	
27	3.2	4.5	3.4	3.3	3.8	4.8	
28	3.2	4.2	3.4	6.6	3.8	4.4	
29	3.1	4.1	3.2	9.6	3.7	4.3	
30	3.1	4.1	3.1	(a)	3.6	4.1	
31		3.75	3.1		3.6		11

[a] Water over gage.
[b] Gage heights estimated from records at Pera.

PEA RIVER AT PERA, ALA.

is station was established August 27, 1904. It is located at the ı wagon bridge, about one-half mile west of Pera, Ala., a station .e Georgiana and Graceville branch of the Louisville and Nash- Railroad. The conditions at this station and the bench marks escribed in Water-Supply Paper No. 168, page 103, where are ı also references to publications that contain data for previous ı.

Discharge measurements of Pea River at Pera, Ala., in 1906.

ıte.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ry 22	W. E. Hall	90	768	8.01	1,810
.....	F. A. Murray	74	393	3.52	474
ber 14	do	75	306	3.38	480
ber 14	do	75	306	3.42	488
ber 14	do	75	300	3.38	465

Daily gage height, in feet, of Pea River at Pera, Ala., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	10.1	9.1	7.3	7.7	3.9	4.5	3.9	4.5	3.2	17.4	4.0	5.1
.....	9.4	8.7	7.0	8.0	3.7	4.3	5.0	4.2	3.5	15.1	4.0	5.1
.....	9.4	8.4	14.0	8.5	3.6	4.6	5.3	4.0	3.6	12.9	3.9	4.9
.....	15.8	7.9	16.0	7.8	4.3	4.2	4.0	3.9	3.3	13.5	3.8	4.9
.....	14.8	7.6	15.1	7.1	7.0	3.8	5.4	3.7	3.1	10.1	3.8	4.8
.....	12.0	7.5	13.1	6.6	10.4	3.6	4.4	4.2	3.1	10.1	3.7	4.8
.....	11.1	7.3	11.9	6.2	7.2	3.4	3.8	4.5	3.8	11.2	3.7	4.8
.....	10.8	8.5	15.1	6.0	14.2	3.3	3.4	4.4	3.8	9.2	3.7	4.6
.....	11.3	12.3	17.8	5.8	12.8	3.3	3.3	4.1	4.7	8.0	3.6	4.5
.....	10.9	11.6	15.4	5.8	9.5	4.2	5.0	3.5	5.4	7.1	3.7	4.5
.....	9.4	10.5	13.3	5.9	8.4	4.3	10.0	3.4	4.4	6.4	3.6	5.7
.....	10.0	9.7	12.4	5.7	7.7	4.2	8.8	7.9	4.1	6.0	3.8	5.9
.....	10.7	9.2	12.3	5.7	7.1	4.8	10.2	9.1	3.6	5.6	3.6	5.2
.....	9.7	9.4	11.4	5.9	6.1	4.5	12.6	7.2	3.4	5.3	3.6	5.0
.....	9.2	9.7	11.0	7.5	5.7	6.9	14.1	8.9	3.3	5.0	3.7	4.8
.....	8.8	9.1	10.7	7.4	5.0	6.0	15.0	7.5	3.1	4.7	5.2	4.6
.....	8.4	8.3	9.3	6.6	4.8	5.2	15.6	7.1	2.8	4.6	4.8	4.8
.....	8.0	7.8	8.6	6.2	4.8	8.7	14.3	5.4	2.8	4.4	8.4	6.9
.....	7.9	7.4	8.2	5.7	4.6	6.2	11.2	4.7	2.7	4.8	12.2	6.6
.....	7.8	7.4	10.0	5.5	4.4	5.8	9.8	4.3	2.6	4.9	11.0	7.6
.....	7.5	7.5	9.8	5.4	4.3	5.4	10.5	4.1	3.0	4.9	10.4	7.8
.....	9.5	8.2	9.0	5.1	8.8	4.2	9.3	4.0	3.3	5.0	9.3	6.8
.....	16.7	7.7	8.4	4.9	5.0	3.7	7.0	3.8	3.3	5.6	8.4	6.4
.....	17.0	7.3	8.4	4.7	4.5	3.5	6.5	3.8	3.1	5.6	8.0	6.0
.....	17.5	7.6	9.2	4.4	5.4	3.4	6.4	3.6	3.3	5.3	7.6	5.8
.....	19.5	7.7	8.8	4.1	7.6	3.3	5.7	3.5	3.1	5.0	7.3	5.4
.....	18.8	7.2	8.3	3.9	7.3	3.3	7.4	3.2	4.5	4.6	6.9	5.4
.....	14.6	7.0	7.7	4.1	7.0	3.0	6.0	3.1	13.9	4.4	6.2	5.2
.....	11.6	.....	7.2	4.0	6.4	3.6	5.4	3.4	20.7	4.3	5.6	5.2
.....	10.3	.....	7.9	4.0	5.5	3.1	5.6	3.1	19.2	4.2	5.3	5.1
.....	9.5	.....	7.9	.....	4.9	.....	5.4	3.0	.....	4.1	.....	12.8

Rating table for Pea River at Pera, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.60	342	3.60	528	4.60	754	6.20	1,245
2.70	360	3.70	548	4.70	780	6.40	1,315
2.80	378	3.80	568	4.80	806	6.60	1,385
2.90	396	3.90	590	4.90	834	6.80	1,460
3.00	414	4.00	612	5.00	862	7.00	1,540
3.10	432	4.10	634	5.20	920	8.00	1,940
3.20	450	4.20	656	5.40	980	9.00	2,400
3.30	468	4.30	680	5.60	1,040	10.00	2,900
3.40	488	4.40	704	5.80	1,105		
3.50	508	4.50	728	6.00	1,175		

NOTE.—The above table is based on discharge measurements made during 1904-1906 and is well below gage height 7 feet. Above gage height 8.80 feet the rating curve is a tangent, the difference 50 per tenth.

Monthly discharge of Pea River at Pera, Ala., for 1906.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in
January	7,650	1,740	3,680	3.12	
February	4,050	1,540	2,190	1.86	
March	6,800	1,540	3,280	2.78	
April	2,160	590	1,170	.992	
May	5,000	528	1,480	1.25	
June	2,260	414	752	.637	
July	5,700	468	2,060	1.75	
August	2,450	414	857	.726	
September	8,250	342	1,150	.975	
October	6,600	634	1,760	1.49	
November	4,000	528	1,250	1.06	
December	4,300	728	1,130	.958	
The year	8,250	342	1,730	1.47	

NOTE.—Values for 1906 are good.

MISCELLANEOUS MEASUREMENTS IN CHOCTAWHATCHEE RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurem made in Choctawhatchee River drainage basin during 1906:

Pea River near Elba, Ala.—A measurement was made Septen 18, 1906, from a bateau about 700 feet below the Pea River Po Company's dam, which is located 6 miles from Elba, Ala. The st of the river at this time was very low.

Width, 89 feet; area, 217 square feet; discharge, 197 second-feet.

Whitewater River at Elba, Ala.—Measurements were made from downstream side of a single-span iron highway bridge in Elba, . The bench mark is the center of the steel connecting pin which c nects the second downstream vertical post from the right end of bridge to the second floor beam; elevation, 42.44 feet above datum of the assumed gage.

Discharge measurements of Whitewater River at Elba, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ary 21...	W. E. Hall	65	242	5.14	585
.....	F. A. Murray	54	119	3.26	115
nber 19...	do	49	105	3.03	60

ESCAMBIA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

cambia River drains the south-central portion of Alabama and ies into the Gulf of Mexico through Escambia Bay and Pensacola Conecuh River joins the Escambia about 5 miles south of the ama-Florida State line, and is very much the larger of the two hes. Conecuh River rises in Bullock County, Ala., very close to eadwaters of Pea River in the Choctawhatchee drainage, and southwestward throughout its course. Pigeon and Patsaliga s, both from the west, are the principal tributaries of Conecuh . The Conecuh and its tributaries are swift streams and at s there are rocky shoals and rapids.

CONECUH RIVER AT BECK, ALA.

is station was established August 24, 1904. It is located at Sim- Bridge at Beck, Ala., about 12 miles below the mouth of Pat- Creek. The nearest railway station is Andalusia, Ala., 8 miles on the Central of Georgia and Louisville and Nashville railways. conditions at this station and the bench marks are described in r-Supply Paper No. 168, page 106, where are given also refer- to publications that contain data for previous years.

Discharge measurements of Conecuh River at Beck, Ala., in 1906.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ry 23....	W. E. Hall	121	654	5.18	1,680
.....	F. A. Murray	115	332	2.06	431
ber 13...	do	118	469	3.22	871

Daily gage height, in feet, of Conecuh River at Beck, Ala., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	7.3	6.5	5.3	6.3	2.5	2.8	1.6	2.9	1.6	15.1	2.9	3.5
.....	6.6	5.8	5.2	6.7	2.4	2.6	2.4	2.7	1.6	15.3	2.9	3.3
.....	8.0	5.2	10.3	7.2	2.2	2.5	2.0	2.5	1.6	16.9	2.9	3.2
.....	10.4	4.8	11.2	7.5	2.7	2.3	2.3	2.4	1.4	17.6	2.8	3.0
.....	9.2	4.5	10.4	7.0	5.2	2.2	2.2	2.9	1.8	16.6	2.8	3.0

Daily gage height, in feet, of Conecuh River at Beck, Ala., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
6	7.8	4.2	8.5	6.1	6.0	2.2	2.3	2.5	2.1	16.3	2.7	
7	7.7	4.5	7.6	5.4	6.5	2.1	2.3	2.3	1.9	14.1	2.7	
8	6.8	6.0	10.4	4.7	7.3	1.9	2.35	2.2	1.8	11.8	2.7	
9	6.9	8.1	11.3	4.3	7.1	1.9	2.45	2.0	2.8	9.0	2.6	
10	6.6	8.8	11.0	4.2	6.2	2.1	2.5	1.9	3.0	7.6	2.6	
11	6.5	7.7	9.7	4.2	5.9	2.0	3.7	3.9	4.5	6.9	2.6	
12	6.8	7.2	9.2	4.2	5.6	1.9	4.8	4.8	4.3	6.4	2.6	
13	6.6	6.8	8.8	4.1	5.9	2.2	4.1	3.0	3.3	5.5	2.5	
14	6.0	7.1	8.9	4.1	5.7	2.6	4.2	7.2	3.0	5.2	2.5	
15	5.8	7.5	10.5	5.8	4.8	3.2	6.2	5.5	2.6	4.5	3.5	
16	5.5	7.2	9.7	6.2	4.2	2.7	7.3	4.3	2.8	4.3	3.1	
17	5.2	7.0	8.4	5.6	3.4	2.7	6.8	3.7	2.8	4.0	3.2	
18	4.9	6.1	7.6	5.3	3.1	2.7	6.7	3.1	2.3	3.9	4.5	
19	5.0	5.4	6.8	4.9	2.9	2.4	7.7	2.8	2.0	3.8	4.9	
20	5.1	5.1	6.7	4.5	2.7	2.8	7.4	2.6	1.9	3.8	4.9	
21	5.3	5.4	6.7	4.1	2.7	2.4	6.1	2.4	1.8	3.7	5.0	
22	6.5	5.3	6.2	3.7	2.7	1.9	6.2	2.4	2.1	3.6	5.2	
23	8.9	5.2	6.3	3.5	2.6	1.8	5.9	2.2	2.4	3.6	4.9	
24	9.0	5.0	6.2	3.2	2.6	1.8	4.9	2.0	2.8	3.6	4.7	
25	7.6	5.2	6.1	3.0	3.0	1.7	4.2	1.8	2.6	3.5	4.5	
26	7.3	5.6	6.3	2.9	3.1	1.6	4.0	1.8	2.4	3.4	4.4	
27	7.2	5.4	6.0	2.8	3.2	1.5	4.4	1.9	6.0	3.3	4.2	
28	7.6	5.7	6.0	2.7	3.7	1.5	5.1	1.9	16.0	3.2	4.0	
29	8.4	.....	5.8	2.6	3.5	1.5	4.4	1.8	16.5	3.1	3.9	
30	8.4	.....	5.8	2.5	3.5	1.5	4.4	1.7	16.3	3.0	3.8	
31	7.6	.....	5.7	.....	3.1	.....	3.4	1.6	.....	3.0	.....	

Rating table for Conecuh River at Beck, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	278	2.70	600	4.00	1,155	6.60	2,575
1.50	295	2.80	640	4.20	1,245	6.80	2,705
1.60	313	2.90	680	4.40	1,340	7.00	2,840
1.70	332	3.00	720	4.60	1,440	8.00	3,560
1.80	352	3.10	760	4.80	1,540	9.00	4,360
1.90	373	3.20	800	5.00	1,640	10.00	5,200
2.00	395	3.30	840	5.20	1,750	11.00	6,100
2.10	418	3.40	885	5.40	1,860	12.00	7,050
2.20	443	3.50	930	5.60	1,970	13.00	8,000
2.30	470	3.60	975	5.80	2,080	14.00	9,000
2.40	500	3.70	1,020	6.00	2,190		
2.50	530	3.80	1,065	6.20	2,315		
2.60	565	3.90	1,110	6.40	2,445		

NOTE.—The above table is based on discharge measurements made during 1904–1906 and is w defined below gage height 5.1 feet. Above 13 feet the rating curve is a tangent, the difference being 1 per tenth.

Monthly discharge of Conecuh River at Beck, Ala., for 1906.

[Drainage area, 1,290 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inche
January	5,560	1,590	2,940	2.28	2
February	4,200	1,240	2,260	1.75	1
March	6,380	1,750	3,620	2.81	3
April	3,190	530	1,530	1.19	1
May	3,050	443	1,260	.977	1
June	800	295	453	.351	
July	3,340	343	1,420	1.10	
August	2,980	313	711	.551	
September	11,500	278	1,680	1.30	
October	12,600	720	3,760	2.91	
November	1,750	530	974	.755	
December	3,800	640	955	.740	
The year	12,600	278	1,800	1.39	1

NOTE.—Values for 1906 are good.

:ELLANEOUS MEASUREMENT IN ESCAMBIA RIVER DRAINAGE BASIN.

he following miscellaneous discharge measurement was made in ımbia River drainage basin during 1906:

mecuh River near Brantley, Ala.—A measurement was made June 06, at a logging railway bridge one-half mile southeast of Brant- Ala. The bench mark is the top of the upstream end of the sec- wooden crossbeam from the right end of the bridge; elevation, 21 above the datum of the assumed gage.

lth, 60 feet; area, 266 square feet; gage height, 4.95 feet; discharge, 131 second-feet.

MOBILE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

ıis is the largest drainage basin in Georgia and Alabama and is nated the Mobile basin because its waters all enter the Gulf ıgh Mobile River at Mobile, Ala. Beginning at the headwaters, ɔcay and Ellijay rivers unite at Ellijay, Ga., to form Coosawattee r. Just above Resaca, Ga., this unites with the Conasauga to Oostanaula River. At Rome, Ga., the Oostanaula and the vah unite to form Coosa River. Six miles above Montgomery, , the Coosa and the Tallapoosa unite to form Alabama River, and 'ar from the coast the Tombigbee unites with the Alabama to form ile River, which flows into Mobile Bay, an arm of the Gulf of ico.

ıhaba River is the principal tributary of the Alabama and joins it ıt 10 miles below Selma. Hillabee Creek flows into Tallapoosa ɔr just above Sturdevant and near Alexander. Talladega Creek tributary of the Coosa.

ɔmbigbee River rises in the northeastern part of Mississippi and rs Alabama in Pickens County. Its principal tributary is the :k Warrior, which is formed by the junction of Mulberry Fork and ey Fork. Locust Fork enters the Black Warrior some distance w the junction.

ALABAMA RIVER AT SELMA, ALA.

his station, which was originally established by the United States ineer Corps, is now maintained by the United States Weather ɜau. It is located at the iron highway bridge one block from er street, Selma, Ala. The conditions at this station and the :h marks are described in Water-Supply Paper No. 168, page 109, re are given also references to publications that contain data for ious years.

Discharge measurements of Alabama River at Selma, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 21	F. A. Murray	573	23,400	42.26	114,000
March 22	do	679	26,500	47.40	128,000
March 23	do	696	28,100	49.78	143,000
March 24	do	709	28,700	50.42	144,000
March 26	do	684	26,900	47.95	134,000
March 27	do	581	25,000	45.08	116,000
March 28	do	580	23,900	4[illegible].08	106,000
June 27	do	393	4,760	3.88	13,600
October 26	W. E. Hall	449	7,230	9.94	26,700

Daily gage height, in feet, of Alabama River at Selma, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	13.5	13.4	8.2	43.4	5.7	4.6	5.2	11.9	6.5	26.9	5.3	13.2
2	12.7	12.0	7.2	42.3	5.5	4.8	4.7	12.6	6.4	28.9	5.0	8.9
3	10.0	11.1	7.0	39.8	5.5	4.1	3.9	11.5	6.5	32.3	4.8	7.0
4	12.0	10.0	10.6	36.2	5.7	3.6	3.3	10.5	6.8	34.2	4.7	6.4
5	20.0	9.3	16.6	31.5	6.8	3.2	3.9	9.8	7.1	34.3	4.4	5.8
6	25.8	8.6	19.4	26.0	10.0	3.1	4.5	11.6	7.3	33.6	4.3	5.7
7	28.6	8.0	19.5	20.3	11.7	3.3	4.0	11.2	8.3	32.9	4.1	5.3
8	29.0	7.7	18.8	16.0	14.7	3.3	3.4	10.4	10.0	31.5	4.0	5.2
9	27.8	8.0	19.2	13.3	17.5	3.5	3.6	9.7	13.1	29.2	3.9	5.2
10	25.2	9.3	20.1	12.1	18.0	3.4	5.0	9.1	13.2	26.0	3.8	5.1
11	22.4	9.9	19.7	11.6	15.7	3.3	7.4	8.7	11.1	21.7	3.7	5.1
12	18.5	9.5	17.4	11.9	13.1	3.4	7.9	8.0	9.3	16.8	3.6	5.3
13	14.9	8.7	14.8	12.0	10.5	3.2	7.5	7.9	10.3	12.8	3.5	7.3
14	13.0	7.9	12.7	11.6	8.3	3.0	7.5	8.7	12.0	10.1	3.4	8.9
15	12.1	7.4	11.2	11.2	6.8	3.0	5.9	10.7	10.8	8.6	3.5	9.4
16	11.4	7.2	11.1	11.0	6.0	5.2	11.6	14.5	8.5	7.5	3.7	9.5
17	10.7	7.1	13.2	10.8	5.5	10.5	15.3	15.0	7.0	6.8	4.0	9.0
18	10.0	7.0	18.1	10.1	5.1	14.3	18.2	13.2	6.2	6.4	4.5	8.9
19	9.8	6.2	24.3	9.6	4.8	15.2	19.3	10.8	5.5	6.2	6.8	10.4
20	9.7	6.0	34.2	9.2	4.6	14.7	22.1	8.9	4.9	7.6	9.5	12.0
21	9.7	5.7	41.0	8.7	4.4	13.2	24.5	8.1	4.3	13.1	17.1	12.2
22	9.8	6.5	46.5	8.2	4.1	10.9	25.6	7.8	4.9	16.5	21.2	12.4
23	14.4	7.3	49.2	7.7	4.1	8.3	25.4	8.0	7.5	18.0	23.0	12.5
24	20.0	7.2	50.2	7.4	4.6	6.2	24.9	7.2	8.2	16.9	23.3	11.9
25	22.8	7.0	50.0	7.2	4.7	4.9	24.6	6.1	8.3	14.2	22.7	10.8
26	23.6	7.3	48.7	6.9	4.3	4.2	23.3	5.5	7.5	11.0	22.0	9.5
27	23.6	8.0	46.3	6.6	4.1	3.8	20.4	5.2	6.7	8.7	21.1	8.5
28	22.4	8.7	43.3	6.3	3.9	4.0	16.9	5.0	9.1	7.6	20.3	7.7
29	21.0	.....	42.5	6.0	3.8	4.1	13.5	5.5	15.1	6.6	19.6	7.5
30	18.9	.....	43.2	5.8	3.7	4.8	12.2	5.6	22.7	6.0	17.5	8.3
31	16.0	.....	43.6	.....	3.6	.....	11.9	6.1	.....	5.7	.....	10.6

Rating table for Alabama River at Selma, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	11,500	5.20	15,820	8.80	23,500	30.00	79,200
3.10	11,690	5.30	16,030	9.00	24,000	31.00	82,000
3.20	11,880	5.40	16,240	10.00	26,300	32.00	84,800
3.30	12,070	5.50	16,450	11.00	28,600	33.00	87,600
3.40	12,260	5.60	16,660	12.00	31,000	34.00	90,400
3.50	12,450	5.70	16,870	13.00	33,470	35.00	93,200
3.60	12,640	5.80	17,080	14.00	36,000	36.00	96,000
3.70	12,830	5.90	17,290	15.00	38,600	37.00	98,800
3.80	13,020	6.00	17,500	16.00	41,200	38.00	101,800
3.90	13,210	6.20	17,920	17.00	43,800	39.00	104,700
4.00	13,400	6.40	18,340	18.00	46,400	40.00	107,600
4.10	13,600	6.60	18,760	19.00	49,100	41.00	110,500
4.20	13,800	6.80	19,180	20.00	51,800	42.00	113,400
4.30	14,000	7.00	19,600	21.00	54,500	43.00	116,300
4.40	14,200	7.20	20,040	22.00	57,200	44.00	119,200
4.50	14,400	7.40	20,480	23.00	59,900	45.00	122,100
4.60	14,600	7.60	20,920	24.00	62,600	46.00	125,000
4.70	14,800	7.80	21,360	25.00	65,300	47.00	128,000
4.80	15,000	8.00	21,800	26.00	68,000	48.00	131,000
4.90	15,200	8.20	22,240	27.00	70,800	49.00	134,000
5.00	15,400	8.40	22,680	28.00	73,600	50.00	137,000
5.10	15,610	8.60	23,120	29.00	76,400	51.00	140,000

NOTE.—The above table is based on discharge measurements made during 1900-1906, and is well defined.

Monthly discharge of Alabama River at Selma, Ala., for 1906.

[Drainage area, 15,400 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	76,400	25,600	45,300	2.94	3.39
February	34,400	16,900	22,500	1.46	1.52
March	138,000	19,600	71,400	4.64	5.35
April	117,000	17,100	40,900	2.66	2.97
May	46,400	12,600	20,800	1.35	1.56
June	39,100	11,500	17,700	1.15	1.28
July	66,900	12,100	33,600	2.18	2.51
August	38,600	15,400	24,600	1.60	1.84
September	59,100	14,000	24,000	1.56	1.74
October	91,200	16,900	46,000	2.99	3.45
November	60,700	12,300	27,600	1.79	2.00
December	34,000	15,600	23,200	1.51	1.74
The year	138,000	11,500	33,100	2.15	29.35

NOTE.—Values for 1906 are excellent.

ETOWAH RIVER NEAR ROME, GA.

This station was established August 17, 1904. It is located at Freemans Ferry, about 5 miles above Rome, Ga. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 115, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Etowah River near Rome, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 8	F. A. Murray	307	1,310	3.85	3,600
June 27	O. P. Hall	305	1,140	3.30	2,850
October 16	F. A. Murray	300	988	2.88	2,180
" 16	do	300	988	2.89	2,160

Daily gage height, in feet, of Etowah River near Rome, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.9	3.8	2.6	5.4	3.3	2.7	2.6	4.0	3.4	10.8	2.75
2	2.8	3.5	2.6	5.0	3.1	2.9	2.5	3.9	3.1	8.8	2.75
3	3.9	3.4	4.8	4.5	3.0	3.0	2.5	3.8	2.8	7.9	2.7
4	15.4	3.4	5.6	4.1	3.5	3.0	2.9	3.7	2.7	6.8	2.7
5	13.3	3.3	4.9	4.0	3.3	2.9	2.8	3.6	2.7	4.8	2.7
6	6.5	3.3	3.5	3.9	3.1	2.8	2.6	3.5	5.5	4.5	2.7
7	4.3	3.2	3.0	3.8	4.0	2.7	3.0	3.3	4.0	4.1	2.7
8	3.9	3.2	3.0	3.7	4.2	2.6	2.7	3.1	3.9	4.0	2.65
9	4.0	3.2	4.8	3.6	3.3	2.6	2.6	2.8	4.8	3.8	2.65
10	3.8	3.1	4.0	4.5	3.0	2.5	3.2	2.7	3.3	3.4	2.6
11	3.5	3.1	3.5	4.0	2.9	2.5	3.0	3.2	3.3	3.2	2.6
12	3.5	3.0	3.2	3.5	2.9	3.0	2.8	2.8	3.2	3.2	2.6
13	3.7	3.0	3.1	3.4	2.8	7.3	2.6	2.7	3.1	3.0	2.6
14	3.5	3.0	3.2	3.4	2.8	9.5	2.5	2.9	2.9	3.0	2.6
15	3.4	3.0	10.4	4.0	2.8	7.7	5.5	3.2	2.8	2.9	2.65
16	3.0	3.0	16.7	3.7	2.7	7.8	4.7	4.0	2.6	2.8	2.7
17	4.0	2.9	9.4	3.5	2.7	6.5	3.5	4.2	2.5	2.85	2.8
18	3.6	2.9	5.8	3.5	2.6	3.6	10.5	4.9	2.5	4.0	3.0
19	3.4	2.8	14.3	3.4	2.6	3.3	8.8	5.0	3.1	8.5	12.9
20	3.5	2.8	22.7	3.3	2.6	3.1	6.0	3.3	4.8	4.5	10.5
21	3.2	2.8	20.0	3.3	2.6	3.0	4.3	4.2	3.6	3.6	9.0
22	7.3	2.9	10.0	3.2	2.6	2.9	4.7	4.0	3.6	3.3	9.0
23	11.3	3.0	5.3	3.2	2.6	2.8	4.8	4.0	3.5	3.2	8.5
24	10.7	2.8	4.5	3.1	2.5	2.7	5.3	3.9	3.5	3.1	7.5
25	5.5	2.8	4.2	3.1	2.5	2.7	3.6	3.5	3.4	3.0	4.0
26	4.5	2.8	4.0	3.1	2.5	4.4	3.2	3.3	3.4	3.0	3.0
27	4.5	2.7	4.1	3.0	5.1	3.4	3.0	3.2	3.3	2.9	3.0
28	4.7	2.7	4.9	3.2	3.7	3.0	2.9	3.0	3.2	2.9	2.9
29	4.5	.....	5.5	3.5	3.2	2.8	3.3	4.0	3.0	2.8	2.9
30	4.2	.....	6.0	3.4	2.9	2.7	4.6	4.2	3.2	2.8	2.8
31	4.0	.....	7.1	.....	2.8	.....	4.4	3.9	.....	2.8	.....

Rating table for Etowah River near Rome, Ga., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.50	570	2.90	2,175	4.60	5,100	9.00	15,180
1.60	650	3.00	2,320	4.80	5,480	10.00	17,880
1.70	735	3.10	2,470	5.00	5,860	11.00	20,700
1.80	830	3.20	2,625	5.20	6,260	12.00	23,600
1.90	930	3.30	2,785	5.40	6,660	13.00	26,660
2.00	1,035	3.40	2,950	5.60	7,080	14.00	29,800
2.10	1,145	3.50	3,120	5.80	7,500	15.00	33,000
2.20	1,260	3.60	3,295	6.00	7,930	16.00	36,300
2.30	1,380	3.70	3,470	6.20	8,370	17.00	39,600
2.40	1,500	3.80	3,645	6.40	8,820	18.00	43,000
2.50	1,625	3.90	3,820	6.60	9,280	19.00	46,500
2.60	1,755	4.00	4,000	6.80	9,740	20.00	50,000
2.70	1,890	4.20	4,360	7.00	10,200		
2.80	2,030	4.40	4,720	8.00	12,600		

NOTE.—The above table is based on discharge measurements made during 1904–1906 and is well de below gage height 4 feet. Above gage height 7 feet the curve becomes uncertain and is only approxi at the high stages.

Monthly discharge of Etowah River near Rome, Ga., for 1905–6.

[Drainage area, 1,800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
.....	35,300	930	3,350	1.86	2.14
.....	20,700	1,140	5,250	2.92	3.04
.....	4,910	1,620	2,160	1.20	1.38
.....	2,320	1,380	1,720	.956	1.07
.....	15,200	1,380	2,940	1.63	1.88
.....	3,640	1,260	1,610	.894	1.00
.....	10,200	1,140	2,650	1.47	1.70
.....	6,060	930	1,840	1.02	1.18
.....	2,320	650	1,050	.583	.65
.....	3,470	650	1,310	.728	.84
.....	2,780	570	985	.547	.61
.....	37,000	1,040	[a] 7,130	3.96	4.56
ear.....	37,000	570	2,670	1.48	20.05
1906.					
.....	34,300	2,030	6,990	3.88	4.47
.....	3,640	1,890	2,410	1.34	1.40
.....	59,400	1,760	11,700	6.50	7.49
.....	6,660	2,320	3,460	1.92	2.14
.....	6,060	1,620	2,430	1.35	1.56
.....	16,500	1,620	3,900	2.17	2.42
.....	19,300	1,620	4,170	2.32	2.68
.....	5,860	1,890	3,350	1.86	2.14
.....	6,870	1,620	2,940	1.63	1.82
.....	20,100	2,030	4,750	2.64	3.04
.....	26,400	1,760	5,010	2.78	3.10
.....	17,300	1,890	3,580	1.99	2.29
ear.....	59,400	1,620	4,560	2.53	34.55

[a] December 21–23 estimated.

'alues for 1905 and 1906 are excellent, except March, 1906, which is good.

COOSA RIVER AT RIVERSIDE, ALA.

station was established September 25, 1896. It is located at ıthern Railway bridge, Riverside, Ala., about 4 miles below o. 4. The conditions at this station and the bench marks are ɔd in Water-Supply Paper No. 168, page 119, where are given ɜrences to publications that contain data for previous years.

Discharge measurements of Coosa River at Riverside, Ala., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
F. A. Murray.....	564	9,630	12.40	44,200
.....do.....	564	9,640	12.45	44,700
.....do.....	564	9,490	12.10	43,300
.....do.....	553	5,130	4.16	11,100
.....do.....	543	4,960	4.03	10,300
M. R. Hall.....	543	4,590	3.78	9,780
W. E. Hall.....	546	5,290	4.77	12,800

Daily gage height, in feet, of Coosa River at Riverside, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	4.9	5.6	2.8	10.8	3.3	2.55	2.6	6.0	3.8	7.5	2.85
2	4.4	5.2	2.8	10.6	3.15	2.35	2.35	5.5	4.1	11.5	2.8
3	6.0	4.8	6.0	9.3	3.0	2.3	2.25	4.9	4.4	12.4	2.8
4	8.8	4.6	8.5	8.4	3.0	2.5	2.4	4.5	4.5	12.5	2.7
5	10.4	4.4	8.9	6.9	3.2	2.75	2.5	5.0	4.2	12.3	2.6
6	11.7	4.0	8.3	6.0	3.4	2.85	2.5	5.4	3.7	12.0	2.55
7	11.9	3.6	7.1	5.5	4.0	2.85	2.5	5.1	5.3	11.0	2.5
8	10.7	3.6	6.0	5.1	3.9	2.9	3.2	5.2	4.6	9.5	2.45
9	7.3	3.6	5.2	4.8	4.2	2.95	3.2	4.8	4.5	8.3	2.4
10	6.1	3.4	4.9	5.5	4.2	2.75	3.3	4.3	4.4	6.8	2.4
11	5.8	3.2	5.2	5.6	3.6	2.25	2.65	3.7	5.4	5.5	2.4
12	5.5	3.1	4.7	5.6	3.2	2.0	2.55	3.7	4.9	4.8	2.35
13	5.5	3.05	4.2	6.1	2.85	2.0	2.55	3.9	4.4	4.2	2.3
14	5.4	3.0	3.8	5.4	2.7	2.0	2.8	3.5	3.9	3.9	2.3
15	5.2	3.0	3.6	4.9	2.65	5.2	5.8	3.5	3.85	3.55	2.35
16	5.2	3.0	10.5	4.4	2.55	8.5	7.5	4.2	3.7	3.3	2.5
17	5.1	2.9	12.9	4.3	2.5	9.5	7.4	4.1	3.2	3.2	2.5
18	5.1	2.8	13.5	4.3	2.4	9.0	10.6	4.0	2.8	3.2	2.75
19	5.1	2.7	16.1	4.2	2.35	7.6	12.3	4.0	2.45	6.0	7.7
20	5.0	2.55	19.8	3.95	2.3	5.9	12.9	4.4	2.45	8.6	10.9
21	4.8	2.5	18.4	3.7	2.3	4.2	12.1	4.9	4.0	9.4	12.5
22	5.6	2.5	17.1	3.6	2.25	3.5	11.2	3.9	4.9	8.2	12.9
23	7.0	2.7	16.1	3.5	2.2	3.1	10.3	3.6	4.6	6.2	12.8
24	8.9	3.1	15.3	3.4	2.15	2.85	9.0	3.3	4.0	4.9	12.7
25	10.4	3.4	14.9	3.3	2.15	2.6	7.4	3.1	3.8	4.0	12.4
26	11.1	3.25	13.9	3.2	2.1	2.6	7.2	3.45	3.9	3.65	12.1
27	10.2	3.1	10.2	3.1	2.1	2.8	6.9	3.45	3.45	3.5	10.8
28	9.1	3.0	11.8	3.0	2.15	3.7	4.7	4.0	3.3	3.35	9.4
29	8.0	.....	12.3	3.0	2.75	3.35	4.0	4.5	3.3	3.15	5.1
30	6.4	.....	12.2	3.15	3.55	2.95	5.0	3.8	5.3	3.05	4.1
31	6.2	.....	11.2	.....	2.95	.....	6.4	3.65	.....	2.95	.....

Rating table for Coosa River at Riverside, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	4,380	3.30	8,060	4.60	12,300	6.80	20,640
2.10	4,635	3.40	8,380	4.70	12,710	7.00	21,440
2.20	4,895	3.50	8,700	4.80	13,070	7.20	22,260
2.30	5,160	3.60	9,020	4.90	13,430	7.40	23,080
2.40	5,425	3.70	9,340	5.00	13,800	7.60	23,920
2.50	5,695	3.80	9,660	5.20	14,540	7.80	24,760
2.60	5,970	3.90	9,980	5.40	15,280	8.00	25,600
2.70	6,250	4.00	10,300	5.60	16,020	9.00	29,800
2.80	6,540	4.10	10,630	5.80	16,760	10.00	34,000
2.90	6,835	4.20	10,970	6.00	17,500	11.00	38,320
3.00	7,135	4.30	11,310	6.20	18,270		
3.10	7,440	4.40	11,660	6.40	19,050		
3.20	7,750	4.50	12,010	6.60	19,840		

NOTE.—The above table is based on discharge measurements made during 1905-1906 and defined below gage height 13 feet. Above gage height 9 feet the rating curve is a tangent, the diff being 426 per tenth.

Monthly discharge of Coosa River at Riverside, Ala., for 1906.

[Drainage area, 7,060 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	42,200	11,700	22,600	3.20	3.69
February	16,000	5,700	8,530	1.21	1.26
March	75,800	6,540	34,400	4.87	5.62
April	37,500	7,140	14,800	2.10	2.34
May	11,000	4,640	6,850	.970	1.12
June	31,900	4,380	10,100	1.43	1.60
July	46,400	5,030	17,600	2.49	2.87
August	17,500	7,440	11,200	1.59	1.83
September	15,300	5,560	10,500	1.49	1.66
October	44,700	6,980	20,400	2.89	3.33
November	46,400	5,160	17,700	2.51	2.80
December	31,900	7,290	12,300	1.74	2.01
The year	75,800	4,380	15,600	2.21	30.13

NOTE.—Values for 1906 are excellent.

OOSTANAULA RIVER AT RESACA, GA.

This station was maintained by the United States Geological Survey from August 1, 1896, to April 30, 1899, and was reestablished at the beginning of 1905; gage-height records are maintained half the year by the United States Weather Bureau. It is located at the bridge of the Western and Atlantic Railway in the town of Resaca, 800 feet south of the station. A standard gage belonging to the United States Geological Survey is located on the downstream side of the bridge at the middle of the first span from the right bank; length of chain, 41.35 feet. The conditions at this station and the bench marks are described in Water-Supply Paper No. 168, page 121, and in Water-Supply Paper No. 197, where are given also data for previous years.

Discharge measurements of Oostanaula River at Resaca, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 2	M. R. Hall	156	1,080	4.60	2,170
May 22	O. P. Hall	138	944	3.42	1,510
June 6	do	165	1,340	5.51	3,080
June 28	do	158	1,080	4.37	2,120
July 26	M. R. Hall	163	1,280	5.97	3,290

Daily gage height, in feet, of Oostanaula River at Resaca, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.8	6.6	3.8	11.8	4.6	3.6	3.8	6.3	9.6	17.3	4.0	4.2
2	4.6	6.4	3.8	8.8	4.4	3.6	3.8	7.6	8.3	17.6	4.0	4.0
3	8.6	5.8	6.8	7.6	4.4	4.6	3.6	5.9	5.0	18.1	4.0	3.8
4	17.5	5.4	10.6	6.6	7.0	4.2	3.6	6.4	5.0	17.8	3.9	3.8
5	17.6	5.0	9.2	6.2	5.4	4.2	3.4	8.6	4.6	15.9	3.9	3.6
6	13.6	5.2	6.2	6.2	5.0	6.6	3.4	7.4	4.8	12.6	3.9	3.8
7	7.6	5.0	5.4	6.0	6.0	4.6	3.4	7.9	4.9	11.0	3.8	4.6
8	6.4	4.8	5.8	5.8	5.4	4.0	3.2	6.0	4.5	10.7	3.8	4.6
9	7.2	4.8	6.2	5.6	5.2	3.8	3.2	5.2	5.9	8.2	3.7	4.8
10	6.8	4.8	5.4	8.6	4.8	3.8	3.4	4.9	4.9	6.6	3.7	6.4

Daily gage height, in feet, of Oostanaula River at Resaca, Ga., in 1906—Continued

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
11	6.2	4.6	4.0	7.0	4.6	3.6	3.4	5.2	4.9	6.0	3.6	
12	6.8	4.2	4.8	6.2	4.2	3.8	3.2	4.5	7.2	5.6	3.6	
13	6.2	4.2	4.6	5.8	4.2	10.6	3.2	4.4	7.5	5.2	3.6	
14	5.9	4.2	4.4	5.2	4.0	17.5	3.6	8.6	6.5	5.0	3.5	
15	6.0	4.2	19.1	6.6	4.0	17.0	9.0	5.0	4.8	4.8	4.4	
16	5.6	4.0	21.8	6.4	4.0	15.6	8.6	7.5	4.3	4.7	4.4	
17	6.2	4.0	20.8	5.6	3.9	13.2	9.8	6.2	4.0	4.6	4.8	
18	5.6	4.0	13.4	5.2	3.8	7.6	14.6	5.2	3.8	9.4	7.8	
19	5.6	3.8	13.4	5.0	3.8	6.0	15.4	5.8	6.6	13.8	23.0	
20	5.4	3.8	19.6	4.8	3.8	5.2	16.4	5.1	7.5	11.5	29.0	
21	5.2	3.8	17.2	4.8	3.6	5.0	14.6	5.1	6.9	7.4	30.0	
22	10.2	5.0	12.4	4.4	3.6	4.6	10.0	4.6	6.2	5.8	27.8	
23	17.2	4.2	8.2	4.4	3.4	4.4	12.2	4.9	6.2	5.4	24.0	
24	17.4	4.2	7.4	4.4	3.2	4.8	11.0	4.8	6.4	5.1	16.0	
25	11.4	4.0	6.6	4.4	3.2	5.8	8.6	5.2	6.0	4.9	7.6	
26	8.4	4.0	6.2	4.4	3.2	5.0	6.0	4.9	5.2	4.7	5.8	
27	8.2	3.8	6.7	4.4	6.4	4.6	5.4	5.8	4.7	4.6	5.4	
28	9.2	3.8	8.2	5.6	4.4	4.0	5.0	5.1	4.4	4.4	4.9	
29	8.2	.....	9.2	5.4	4.0	3.8	5.8	4.8	4.3	4.3	4.7	
30	7.8	.....	10.8	5.2	4.0	3.8	8.1	5.9	6.3	4.2	4.5	
31	7.8	.....	13.8	.....	3.8	.....	7.4	7.8	.....	4.2	.....	

Rating table for Oostanaula River at Resaca, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.20	1,290	4.60	2,[illegible]50	6.00	3,340	8.80	6,060
3.30	1,350	4.70	2,305	6.20	3,520	9.00	6,280
3.40	1,410	4.80	2,380	6.40	3,700	10.00	7,420
3.50	1,475	4.90	2,455	6.60	3,880	11.00	8,640
3.60	1,540	5.00	2,530	6.80	4,060	12.00	9,930
3.70	1,605	5.10	2,610	7.00	4,250	13.00	11,280
3.80	1,670	5.20	2,690	7.20	4,450	14.00	12,680
3.90	1,735	5.30	2,770	7.40	4,650	15.00	14,120
4.00	1,800	5.40	2,850	7.60	4,850	16.00	15,600
4.10	1,870	5.50	2,930	7.80	5,050	17.00	17,100
4.20	1,940	5.60	3,010	8.00	5,250	18.00	18,600
4.30	2,010	5.70	3,090	8.20	5,450		
4.40	2,080	5.80	3,170	8.40	5,650		
4.50	2,155	5.90	3,250	8.60	5,850		

NOTE.—The above table is based on eleven discharge measurements made during 1904–1906 and is defined below gage height 6 feet. Above gage height 16 feet the rating curve is a tangent, the differ being 150 per tenth.

Monthly discharge of Oostanaula River at Resaca, Ga., for 1906.

[Drainage area, 1,610 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inch
January	18,000	2,230	6,330	3.93	
February	3,880	1,670	2,220	1.38	
March	21,300	1,670	7,760	4.82	
April	9,670	2,080	3,410	2.12	
May	4,250	1,290	2,100	1.30	
June	17,800	1,540	4,220	2.62	
July	16,200	1,290	4,880	3.03	
August	5,850	2,080	3,320	2.06	
September	6,940	1,670	3,180	1.98	
October	18,800	1,940	6,460	4.01	
November	36,600	1,480	7,560	4.70	
December	13,000	1,540	3,710	2.30	
The year	36,600	1,290	4,600	2.86	

NOTE.—Values are rated as follows: March and November good; remainder of 1906 excellent.

COOSAWATTEE RIVER AT CARTERS, GA.

This gaging station was established August 15, 1896, at the iron hway bridge at Carters, Murray County, Ga. It is at the foot of great shoals made by this stream in cutting through the Cohutta untains. The conditions at this station and the bench marks are cribed in Water-Supply Paper No. 168, page 124, and in Water-ply Paper No. 197, where are given also data for previous years.

Discharge measurements of Coosawattee River at Carters, Ga., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
17	O. P. Hall	115	615	4.38	2,140
30	do	127	1,130	8.25	4,540
	do	112	1,080	7.90	4,660

Daily gage height, in feet, of Coosawattee River at Carters, Ga., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	2.4	3.2	2.3	4.6	2.8	2.5	2.1	3.0	2.8	7.0	2.3	2.9
	3.0	3.2	2.4	4.0	2.8	3.0	2.1	4.0	2.8	6.0	2.3	2.8
	10.5	3.1	5.0	3.9	4.2	2.6	2.4	3.5	2.7	5.6	2.3	2.8
	4.0	3.1	4.0	3.7	3.3	2.5	2.5	3.0	2.6	5.0	2.2	2.8
	3.0	3.0	3.0	3.5	3.0	5.5	2.3	7.0	2.6	5.0	2.2	2.7
	2.6	3.0	2.9	3.6	5.0	3.0	2.2	5.0	2.5	4.8	2.1	2.8
	2.5	3.2	2.8	4.0	3.9	2.5	2.2	3.5	2.5	4.5	2.1	2.8
	2.5	3.2	2.8	3.8	3.6	2.5	2.1	3.0	7.0	4.3	2.1	2.7
	2.8	3.0	2.8	5.0	3.0	2.4	2.3	2.6	4.0	3.5	2.2	2.7
	3.0	2.9	2.7	4.5	2.8	2.4	2.3	2.8	3.5	3.3	2.3	4.5
	3.5	2.9	2.7	4.0	2.6	2.8	2.2	3.0	3.4	3.1	2.4	3.2
	3.0	2.8	2.7	3.0	2.6	2.7	2.2	2.8	3.0	3.0	2.4	3.0
	2.5	2.7	3.0	2.8	2.5	14.0	2.1	2.6	2.8	2.9	2.3	2.8
	2.5	2.6	4.0	2.8	2.5	5.5	3.5	2.6	2.7	2.8	2.3	2.8
	2.5	2.5	18.8	4.0	2.5	8.0	2.5	2.5	2.7	2.7	2.4	2.8
	3.6	2.4	6.0	3.6	2.4	5.0	2.0	2.5	2.6	2.6	2.4	3.0
	3.5	2.4	5.0	3.4	2.4	4.5	3.0	2.5	2.5	2.6	2.6	3.6
	3.5	2.4	4.8	3.2	2.3	3.5	5.5	2.6	2.5	5.0	13.2	4.0
	3.6	2.4	13.0	3.1	2.3	3.0	8.2	2.8	5.0	3.5	26.0	4.8
	3.6	2.4	7.0	3.0	2.2	2.8	5.0	2.7	4.0	3.3	9.4	3.8
	3.8	2.4	5.0	3.0	2.2	2.7	4.2	2.6	3.0	3.1	5.4	3.7
	10.5	2.6	4.0	3.0	2.1	2.6	5.0	2.5	2.8	3.0	4.8	3.7
	11.0	2.5	3.8	2.9	2.1	2.5	4.6	2.5	2.5	3.8	4.0	3.6
	6.5	2.5	3.7	2.9	2.1	3.1	4.0	2.8	2.6	3.6	3.6	3.6
	4.5	2.5	3.6	2.8	2.1	3.0	3.5	2.7	4.2	3.4	3.4	3.6
	4.0	2.4	3.5	2.8	7.0	2.9	3.0	2.6	2.8	3.2	3.2	3.5
	3.5	2.4	4.3	2.7	3.0	2.8	3.5	2.6	2.6	3.0	3.1	3.5
	3.5	2.4	4.2	4.0	2.8	2.5	3.5	2.8	2.5	2.6	3.05	4.5
	3.4	.....	4.1	3.0	2.6	2.4	4.0	2.7	2.5	2.4	3.0	5.0
	3.4	.....	8.5	3.0	2.5	2.3	4.7	2.6	4.9	2.4	3.0	5.0
	3.3	.....	5.4	.....	2.5	.....	3.1	3.0	.....	2.4	.....	9.0

Rating table for Coosawattee River at Carters, Ga., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	785	2.80	1,170	3.60	1,620	4.80	2,410
2.10	830	2.90	1,220	3.70	1,680	5.00	2,550
2.20	875	3.00	1,275	3.80	1,740	5.20	2,694
2.30	920	3.10	1,330	3.90	1,805	5.40	2,838
2.40	970	3.20	1,385	4.00	1,870	5.60	2,982
2.50	1,020	3.30	1,440	4.20	2,000	5.80	3,126
2.60	1,070	3.40	1,500	4.40	2,130	6.00	3,270
2.70	1,120	3.50	1,560	4.60	2,270	7.00	3,990

E.—The above table is based on discharge measurements made during 1902-1906 and is well defined gage height 8 feet. Above gage height 5 feet the rating curve is a tangent, the difference being 72 ith.

Monthly discharge of Coosawattee River at Carters, Ga., for 1906.

[Drainage area, 531 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	6,870	970	1,990	3.75	4.3
February	1,380	970	1,130	2.13	2.2
March	12,500	920	2,480	4.67	5.3
April	2,550	1,120	1,550	2.92	3.2
May	3,990	830	1,260	2.37	2.7
June	9,030	920	1,710	3.22	3.5
July	4,850	785	1,510	2.84	3.2
August	3,990	1,020	1,320	2.49	2.8
September	3,990	1,020	1,380	2.60	2.9
October	3,990	970	1,710	3.22	3.7
November	17,700	830	2,140	4.03	4.5
December	5,430	1,120	1,670	3.15	3.6
The year	17,700	785	1,650	3.12	42.3

NOTE.—Values are rated as follows: January February, April to October, and December, excellent March and November are only good, owing to liability of backwater at high stages.

CHOCCOLOCCO CREEK NEAR JENIFER, ALA.

The gage at this station was established August 20, 1902. It i located at the Louisville and Nashville Railroad bridge, 1¼ miles nort of Jenifer, Ala. There are small shoals both above and below th bridge. The conditions[a] at this station and the bench marks ar described in Water-Supply Paper No. 168, page 130, where are give also references to publications that contain data for previous years.

Discharge measurements of Choccolocco Creek near Jenifer, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 16	M. R. Hall	144	582	5.85	2,3
March 16	F. A. Murray	144	585	5.85	2,2
April 18	do	107	231	2.84	4
June 20	do	102	178	2.40	2
June 20	do	102	178	2.41	2
August 29	M. R. Hall	100	205	2.62	3

Daily gage height, in feet, of Choccolocco Creek near Jenifer, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
1	2.9	2.7	2.3	4.4	2.5	2.3	2.15	2.8	2.7	6.1	2.6	2.7
2	2.75	2.65	2.3	3.9	2.45	2.3	2.2	2.7	3.0	7.1	2.7	2.7
3	2.9	2.6	2.6	3.5	2.4	2.3	2.3	2.9	2.7	6.9	2.5	2.65
4	5.4	2.6	3.7	3.4	2.5	2.3	2.2	2.8	2.6	5.1	2.8	2.6
5	5.6	2.5	3.3	3.3	2.85	2.25	2.2	3.6	2.5	4.0	2.5	2.6
6	4.4	2.5	3.3	3.2	3.0	2.2	2.1	3.1	4.0	3.8	2.5	2.6
7	3.45	2.5	2.85	3.1	3.5	2.3	2.1	3.0	6.4	3.6	2.5	2.6
8	3.3	2.5	2.7	3.0	3.5	2.2	4.4	2.9	5.1	3.3	2.5	2.6
9	3.2	2.5	3.1	2.9	2.9	2.2	3.9	2.8	3.5	3.1	2.5	2.5
10	2.9	2.5	2.9	3.7	2.7	2.2	2.7	2.7	4.4	3.0	2.5	2.5
11	3.0	2.45	2.8	3.4	2.6	2.2	2.5	2.7	4.0	2.9	2.5	4.5
12	3.0	2.4	2.8	3.1	2.5	2.1	2.4	4.1	3.2	2.8	2.5	4.5
13	3.0	2.4	2.6	3.0	2.5	2.1	2.3	3.6	3.4	2.7	2.5	3.2
14	2.9	2.4	2.5	3.0	2.45	2.2	2.5	4.6	2.9	2.7	2.5	3.0
15	2.8	2.4	4.1	3.2	2.45	3.7	6.7	6.5	2.8	2.6	2.8	2.9

[a] *A second section of the gage is attached to the upstream wing wall of the left bank abutment, reading from 10 feet to 15 feet.*

Daily gage height, in feet, of Choccolocco Creek near Jenifer, Ala., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	2.8	2.35	5.2	3.0	2.4	3.8	5.0	4.5	2.7	2.7	2.8	2.8
17	2.9	2.3	5.6	2.9	2.4	2.8	3.2	3.6	2.6	2.6	2.5	3.1
18	2.8	2.3	3.6	2.8	2.4	2.5	6.9	3.0	2.7	3.9	2.5	3.1
19	2.9	2.3	11.5	2.75	2.4	2.45	8.4	2.9	2.6	4.9	4.5	3.5
20	2.9	2.3	14.2	2.7	2.4	2.5	6.5	2.9	2.6	4.5	5.2	3.4
21	2.9	2.3	7.5	2.7	2.4	2.4	4.5	3.0	2.8	3.5	5.5	3.3
22	3.2	2.4	5.2	2.7	2.4	2.3	3.5	2.7	2.8	3.0	4.6	3.2
23	4.6	2.4	4.3	2.65	2.35	2.3	4.0	2.6	2.7	3.0	3.2	3.1
24	4.5	2.4	3.8	2.65	2.3	2.3	4.4	2.6	2.6	2.9	3.0	3.0
25	3.6	2.4	3.6	2.6	2.25	2.2	3.5	2.6	2.9	2.9	2.9	2.9
26	3.25	2.4	3.3	2.55	2.3	2.2	3.1	2.85	2.7	2.8	2.8	2.8
27	3.1	2.4	3.3	2.5	2.3	2.3	2.8	2.6	2.6	2.8	2.8	2.8
28	3.0	2.4	5.6	2.5	2.4	2.2	2.8	3.2	2.6	2.7	2.7	2.9
29	2.9	.....	5.8	2.5	2.3	2.2	2.8	2.6	2.6	2.7	2.7	3.4
30	2.8	.....	5.3	2.5	2.3	2.2	3.1	2.7	4.1	2.6	2.7	3.6
31	2.75	.....	4.9	.....	2.3	.....	3.1	3.0	.....	2.7	.....	6.0

Rating table for Choccolocco Creek near Jenifer, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	125	3.20	560	4.40	1,195	6.20	2,620
2.10	145	3.30	605	4.50	1,260	6.40	2,800
2.20	170	3.40	650	4.60	1,325	6.60	3,000
2.30	200	3.50	700	4.70	1,395	6.80	3,200
2.40	235	3.60	750	4.80	1,465	7.00	3,400
2.50	270	3.70	800	4.90	1,535	8.00	4,500
2.60	305	3.80	850	5.00	1,610	9.00	5,600
2.70	345	3.90	905	5.20	1,760	10.00	6,800
2.80	385	4.00	960	5.40	1,920	11.00	8,000
2.90	425	4.10	1,015	5.60	2,080		
3.00	470	4.20	1,075	5.80	2,260		
3.10	515	4.30	1,135	6.00	2,440		

NOTE.—The above table is based on discharge measurements made during 1903-1906 and is well defined below gage height 6 feet. Above gage height 9 feet the rating curve is a tangent, the difference being 120 per tenth.

Monthly discharge of Choccolocco Creek near Jenifer, Ala., for 1906.

[Drainage area, 272 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	2,080	365	645	2.37	2.73
February	345	200	248	.912	.95
March	11,800	200	1,590	5.85	6.74
April	1,200	270	483	1.78	1.99
May	700	185	287	1.06	1.22
June	850	145	240	.882	.98
July	4,940	145	920	3.38	3.90
August	2,900	305	588	2.16	2.49
September	2,800	270	593	2.18	2.43
October	3,510	305	836	3.07	3.54
November	2,000	270	497	1.83	2.04
December	2,440	270	562	2.07	2.39
The year	11,800	145	624	2.30	31.40

NOTE.—Values for 1906 are excellent.

TALLAPOOSA RIVER AT STURDEVANT, ALA.

This station was established July 19, 1900. It is located at t Columbus and Western Railroad bridge, one-fourth mile west of St devant. The conditions at this station and the bench marks described in Water-Supply Paper No. 168, page 132, where are giv also references to publications that contain data for previous years

Discharge measurements of Tallapoosa River at Sturdevant, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Di cha
		Feet.	*Sq. ft.*	*Feet.*	*Sec.*
March 17	M. R. Hall	411	3,870	6.36	1
March 17	F. A. Murray	411	3,880	6.36	1
June 8	M. R. Hall	346	2,420	2.12	

Daily gage height, in feet, of Tallapoosa River at Sturdevant, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.15	3.45	2.85	5.4	2.85	2.3	2.0	3.6	4.5	8.6	2.9
2	3.0	3.3	2.8	4.8	2.8	2.2	2.5	3.9	4.3	8.1	2.85
3	6.8	3.2	5.4	4.4	2.75	2.2	4.4	4.4	3.8	7.4	2.8
4	12.4	3.1	5.6	4.2	3.1	2.15	3.7	6.0	4.1	6.2	2.8
5	9.0	3.1	5.1	4.0	4.3	2.2	3.1	4.3	3.9	5.0	2.7
6	7.5	3.0	4.0	3.9	4.2	2.5	2.9	4.5	7.0	4.7	2.7
7	5.2	3.1	3.4	3.7	4.8	2.25	2.35	4.6	9.1	4.3	2.7
8	4.3	3.2	6.8	3.6	6.7	2.2	3.0	4.0	5.4	3.8	2.7
9	3.9	3.45	6.4	3.5	4.9	2.1	6.5	3.1	4.3	3.5	2.65
10	3.6	3.35	5.2	3.8	4.1	2.0	4.4	2.8	5.4	3.25	2.7
11	3.6	3.3	4.5	4.0	3.5	2.15	4.0	4.0	5.5	3.05	2.65
12	3.65	3.2	4.1	4.5	3.2	2.2	3.0	4.7	6.7	2.95	2.6
13	3.55	3.15	3.75	3.9	3.1	2.3	2.9	4.0	4.7	2.9	2.6
14	3.45	3.1	3.6	3.9	3.0	5.4	3.4	9.4	3.9	2.8	2.65
15	3.35	3.1	6.1	4.2	2.95	8.3	8.5	6.3	3.4	2.75	2.95
16	3.3	3.0	6.5	4.1	2.8	6.8	7.0	5.5	3.05	2.7	3.25
17	3.25	2.9	6.7	3.9	2.75	5.0	5.1	4.3	2.9	2.7	3.05
18	3.25	2.8	5.0	3.6	2.7	4.1	5.6	3.5	2.8	5.3	3.45
19	3.2	2.8	18.8	3.5	2.65	3.5	6.4	4.2	2.7	9.4	9.6
20	3.2	2.75	21.6	3.4	2.6	3.1	7.8	4.1	3.25	7.8	7.1
21	3.5	3.8	14.6	3.35	2.5	2.7	5.5	3.7	3.6	6.6	6.3
22	6.8	3.7	12.0	3.3	2.7	2.55	4.0	3.4	3.8	4.7	4.8
23	7.9	3.5	9.2	3.3	2.6	2.4	5.8	3.35	3.6	3.9	4.1
24	6.5	3.25	5.6	3.25	2.5	2.3	6.5	3.25	3.8	3.5	3.6
25	5.7	3.35	4.6	3.15	2.45	2.15	5.5	3.25	3.7	3.4	3.35
26	4.5	3.15	4.3	3.1	2.4	2.25	4.3	4.0	3.6	3.35	3.2
27	4.2	3.05	4.5	3.05	2.5	2.8	4.0	3.35	3.25	3.15	3.15
28	4.0	2.9	7.6	3.0	2.55	3.1	3.3	3.4	3.6	3.05	3.05
29	3.85	.....	8.2	3.0	2.6	2.9	3.6	5.2	4.6	2.95	2.95
30	3.8	.....	7.2	2.95	2.5	2.4	4.4	3.8	5.6	2.9	2.9
31	3.6	.....	6.2	.....	2.4	.....	4.7	4.3	.....	2.85	.....

AM AND POWER HOUSE OF MONTGOMERY POWER COMPANY ON TALLAPOOSA RIVER ABOVE TALLASSEE, ALA.

ERIOR OF POWER HOUSE OF MONTGOMERY POWER COMPANY ON TALLAPOOSA RIVER ABOVE TALLASSEE, ALA

Rating table for Tallapoosa River at Sturdevant, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	1,460	3.10	2,880	4.20	4,870	5.60	8,330
2.10	1,560	3.20	3,030	4.30	5,090	5.80	8,890
2.20	1,670	3.30	3,190	4.40	5,310	6.00	9,440
2.30	1,790	3.40	3,350	4.50	5,540	6.20	10,000
2.40	1,910	3.50	3,520	4.60	5,770	6.40	10,560
2.50	2,040	3.60	3,690	4.70	6,010	6.60	11,140
2.60	2,170	3.70	3,870	4.80	6,250	6.80	11,740
2.70	2,300	3.80	4,060	4.90	6,500	7.00	12,350
2.80	2,440	3.90	4,250	5.00	6,760	7.20	12,980
2.90	2,580	4.00	4,470	5.20	7,280	7.40	13,630
3.00	2,730	4.10	4,660	5.40	7,800		

NOTE. The above table is based on discharge measurements made during 1904-1906, and is well defined below gage height 10 feet. Above gage height 7 feet the rating curve is a tangent, the difference being 320 per tenth.

Monthly discharge of Tallapoosa River at Sturdevant, Ala., for 1906.

[Drainage area, 2,500 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	29,600	2,730	6,770	2.71	3.12
February	4,060	2,370	3,020	1.21	1.26
March	59,100	2,440	12,700	5.08	5.86
April	7,800	2,660	4,010	1.60	1.78
May	11,400	1,910	3,160	1.26	1.45
June	16,500	1,460	3,230	1.29	1.44
July	17,200	1,460	6,140	2.46	2.84
August	20,000	2,440	5,310	2.12	2.44
September	19,100	2,300	5,540	2.22	2.48
October	20,000	2,300	6,140	2.46	2.84
November	20,700	2,170	4,000	1.60	1.78
December	21,000	2,440	4,660	1.86	2.14
The year	59,100	1,460	5,390	2.16	29.43

NOTE.—Values for 1906 are excellent.

TALLAPOOSA RIVER SURVEY.

In order to point out the power possibilities along the Tallapoosa River, a profile has been prepared showing the fall between Tallaposa, Ga., and Matilda, Ala. In connection with this profile, notes showing tributary streams and other prominent natural and artificial features along the river are indicated.

Sheets showing this profile may be obtained upon application to the Director of the Geological Survey.

Some of the water-power plants on Tallapoosa River are shown on Pls. IV and V.

CAHABA RIVER AT CENTERVILLE, ALA.

This station was established August 7, 1901, and is situated at the iron highway bridge one-fourth mile west of Centerville, Ala., one-half mile above the Mobile and Ohio Railroad bridge. The gage was read during 1906 by Mrs. W. C. Edmonds. The conditions at this

station and the bench marks are described in Water-Supply Paper No. 168, page 134, where are given also references to publications that contain data for previous years.

Discharge measurements of Cahaba River at Centerville, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 4	W. E. Hall	150	656	3.35	779
June 25	F. A. Murray	125	399	1.60	280
October 25	W. E. Hall	154	646	3.26	686

Daily gage height, in feet, of Cahaba River at Centerville, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.1	4.0	4.7	18.7	2.8	2.2	1.9	4.2	3.0	22.9	2.8	2.9
2	3.9	3.5	3.9	13.5	2.8	2.2	2.3	3.4	2.8	21.2	2.7	2.8
3	12.3	3.3	18.2	10.7	2.8	2.3	3.0	3.2	2.7	21.3	2.6	2.8
4	20.9	3.1	20.4	8.7	3.2	2.4	2.2	3.4	2.6	16.2	2.5	2.7
5	17.5	3.0	16.3	7.8	7.6	2.2	1.7	3.2	2.5	10.8	2.7	2.8
6	12.8	2.9	9.7	7.1	5.3	2.3	1.6	2.8	2.1	21.6	2.7	2.8
7	7.6	2.9	6.9	6.5	5.8	2.2	1.6	3.2	2.4	17.8	2.6	2.9
8	6.1	2.9	8.0	5.9	7.8	2.3	1.6	3.0	2.6	12.5	2.6	2.7
9	5.8	2.8	8.1	5.8	5.9	2.1	1.9	2.8	3.2	9.4	2.6	2.9
10	5.3	2.8	6.7	6.3	4.2	2.0	4.4	2.4	2.8	7.4	2.5	3.0
11	4.8	2.6	5.7	6.5	3.7	1.9	3.4	2.6	3.5	6.3	2.4	5.6
12	5.2	2.5	5.5	5.4	3.4	1.8	3.9	4.4	5.0	5.6	2.5	7.2
13	5.7	2.5	4.7	4.9	3.2	1.7	2.9	3.4	5.5	5.1	2.5	5.2
14	5.2	2.7	4.5	4.6	3.0	2.0	10.0	4.2	6.2	4.6	2.4	4.4
15	4.9	2.9	5.3	4.4	2.9	3.0	8.1	5.1	4.8	4.4	2.9	4.0
16	4.5	2.6	5.0	4.3	2.8	2.8	5.7	4.6	3.0	4.1	2.9	3.6
17	4.2	2.5	4.6	4.1	2.7	2.6	5.5	3.6	2.5	4.0	2.7	3.9
18	4.2	2.4	4.1	3.9	2.6	2.4	11.7	3.1	2.3	4.1	3.1	5.0
19	4.2	2.3	33.8	3.8	2.7	2.2	15.8	2.6	2.1	4.6	9.6	4.9
20	4.3	2.2	30.8	3.7	2.6	2.0	10.7	2.4	2.3	4.8	9.8	4.8
21	4.0	2.4	27.0	3.6	2.5	1.9	6.1	2.2	3.6	4.0	6.3	4.7
22	4.7	2.5	19.5	3.9	2.5	1.8	5.0	2.4	3.8	3.7	5.1	4.5
23	17.0	2.6	14.6	3.7	2.5	1.7	8.4	2.8	3.5	3.5	4.3	4.2
24	16.0	2.7	10.0	3.5	2.5	1.6	9.6	2.2	3.3	3.3	3.9	3.9
25	10.4	6.6	8.4	3.4	2.7	1.6	5.7	2.0	3.7	3.2	3.7	3.7
26	7.4	5.6	7.4	3.3	2.7	1.6	4.2	2.4	3.4	3.1	3.3	3.5
27	6.1	5.2	6.9	3.1	2.8	2.6	3.5	1.9	3.1	3.1	3.2	3.5
28	5.2	4.6	24.6	3.0	2.6	3.5	3.1	3.2	20.7	3.0	3.2	3.[illegible]
29	4.7	.....	24.5	3.0	2.5	2.9	4.3	2.5	33.7	2.8	3.0	
30	4.0	.....	26.5	2.9	2.4	2.2	6.9	3.2	29.6	2.8	3.0	
31	4.1	.....	23.4	.....	2.3	.....	5.3	2.4	.....	2.9	.....	

Rating table for Cahaba River at Centerville, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	280	2.80	583	4.00	9[illegible]0	5.40	1,604
1.70	301	2.90	611	4.10	1,030	5.60	1,698
1.80	323	3.00	640	4.20	1,072	5.80	1,794
1.90	346	3.10	670	4.30	1,114	6.00	1,890
2.00	370	3.20	701	4.40	1,156	6.20	1,990
2.10	395	3.30	733	4.50	1,200	6.40	2,090
2.20	421	3.40	766	4.60	1,244	6.60	2,192
2.30	447	3.50	800	4.70	1,288	6.80	2,296
2.40	473	3.60	836	4.80	1,332	7.00	2,400
2.50	500	3.70	874	4.90	1,376	8.00	2,950
2.60	527	3.80	912	5.00	1,420	9.00	3,500
2.70	555	3.90	950	5.20	1,512	10.00	4,050

NOTE. The above table is based on three discharge measurements made during 1906 and on [illegible] of previous curves. It is not well defined. Above gage height 7 feet it is a tangent, the differ[illegible] *55 per tenth.*

CANAL, POWER HOUSE, AND MILLS OF TALLASSEE FALLS MANUFACTURING COMPANY ON TALLAPOOSA RIVER AT TALLASSEE, ALA.

Monthly discharge of Cahaba River at Centerville, Ala., for 1906.

[Drainage area, 1,040 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	10,000	950	2,680	2.58	2.97
y.....	2,190	421	735	.707	.74
.....	1,100	950	5,690	5.47	6.31
.....	8,840	611	1,850	1.78	1.99
.....	2,840	447	847	.814	.94
.....	800	280	426	.410	.46
.....	7,240	280	1,740	1.67	1.92
.....	1,470	346	683	.657	.76
er.....	17,100	395	2,080	2.00	2.23
.....	11,100	583	3,070	2.95	3.40
er.....	3,940	473	913	.878	.98
r.....	9,550	555	1,330	1.28	1.48
e year.....	17,100	280	1,840	1.77	24.18

–Values for 1906 are good.

TOMBIGBEE RIVER AT COLUMBUS, MISS.

s station is located at the county highway bridge at the south Main street, in the city of Columbus, Miss. The conditions at ation and the bench marks are described in Water-Supply Paper 8, page 137, where are given also references to publications that n data for previous years.

Discharge measurements of Tombigbee River at Columbus, Miss., in 1906.

e.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	F. A. Murray.....	127	1,230	0.64	2,040
.....	do.....	125	1,210	.82	1,910
.....	do.....	119	1,170	1.10	1,680
.....	W. E. Hall.....	109	1,190	1.38	1,590
er 18...	M. R. Hall.....	72	876	3.40	424

Daily gage height, in feet, of Tombigbee River at Columbus, Miss., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	3.7	1.5	3.3	18.2	−1.3	−2.3	−3.3	−2.6	−3.2	6.8	2.3	0.4
.....	3.3	.9	2.8	18.2	−1.4	−2.4	−3.2	2.3	3.4	7.7	2.4	.5
.....	5.4	.3	4.0	17.3	−1.6	−2.2	−3.3	−2.2	−3.4	8.3	2.5	.9
.....	9.6	−.1	4.4	15.6	−.9	−1.1	3.4	−2.1	−3.4	8.2	2.5	1.2
.....	11.0	.3	4.4	13.0	+6.9	−.6	−3.4	2.3	3.5	7.6	2.6	1.3
.....	9.9	−.6	4.7	9.2	8.0	−.9	−3.3	−2.7	3.5	11.2	2.6	−1.2
.....	10.3	−.7	4.6	6.0	8.9	−1.6	3.4	−2.9	−3.5	12.3	−2.6	−1.1
.....	10.4	−.8	4.0	4.0	9.6	−1.9	3.5	−3.2	−3.0	11.1	−2.6	−.6
.....	9.0	−.9	2.9	2.8	8.9	2.2	−3.5	3.2	−2.8	9.9	−2.7	−.5
.....	7.2	−1.0	2.0	2.1	7.8	−2.3	3.5	−3.2	3.1	9.2	−2.7	+.2
.....	5.2	−1.1	1.4	1.7	6.3	−2.5	−3.5	−3.2	−3.3	8.1	2.7	2.7
.....	4.8	−1.2	.9	1.5	4.5	−2.7	−3.5	−2.8	−3.3	6.0	−2.7	2.6
.....	4.6	−1.2	.3	1.2	2.3	−2.9	−3.5	−2.6	−3.3	3.3	−2.7	1.5
.....	4.2	−1.1	−.1	.9	−.1	−3.0	−3.2	−2.7	3.4	1.5	−2.7	1.4
.....	5.8	−1.1	+5.2	.7	−1.0	−2.6	−2.9	−2.5	−3.5	.4	−2.6	1.4
.....	3.3	−.9	9.1	.6	−1.3	−1.3	−2.7	−1.5	−3.5	−.5	2.5	1.3
.....	2.4	−.9	9.9	.7	−1.5	−1.2	−.9	−1.8	−3.5	−1.1	−2.4	1.3
.....	2.0	−1.0	10.3	.5	−1.7	−2.0	+2.0	−1.7	−3.4	−1.4	−1.3	4.6
.....	2.3	−1.1	13.0	.1	−2.0	−2.3	3.7	−1.8	−3.4	−1.0	+2.1	5.5
.....	1.9	−1.2	16.8	−.5	−1.9	−2.8	3.2	−2.2	−3.4	−.2	6.1	5.8
.....	1.7	−1.3	16.6	−.7	−2.1	−3.0	2.3	−2.6	−3.4	−.3	6.5	6.0
.....	2.9	−1.2	15.7	−.8	−2.2	−3.1	1.3	−2.4	−3.2	.6	6.8	5.3
.....	6.4	−.9	14.5	−.9	−2.2	−3.3	.8	−2.3	−2.4	.1	7.1	5.0
.....	6.6	−.3	12.6	−.8	−2.3	−3.3	.4	−2.7	−1.6	−.3	6.6	4.3
.....	6.7	+2.4	9.4	−.8	−2.0	−3.3	−.6	−3.0	−1.0	−.7	5.7	3.3

Daily gage height, in feet, of Tombigbee River at Columbus, Miss., for 1906—Co

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
26	7.1	3.5	5.8	−1.0	−2.1	−3.3	−1.3	−2.9	− .6	− .9	4.2
27	7.0	3.4	4.3	−1.3	−1.9	−3.3	−1.6	−3.0	− .3	−1.1	3.2
28	6.0	3.8	12.1	−1.4	−1.3	−3.2	−2.2	−3.2	+3.6	−1.5	2.1
29	4.8	.....	14.0	.0	−1.8	−3.2	−2.4	−3.0	8.5	−1.8	1.2
30	3.5	.....	16.0	−1.0	−1.9	−3.2	−2.6	−3.1	7.3	−2.1	.1
31	2.5	.....	17.7	.....	−2.1	.....	−2.8	−3.2	.....	−2.3	.....

Rating table for Tombigbee River at Columbus, Miss., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
−3.50	340	−1.80	1,260	− .10	2,495	4.00	6,920
−3.40	380	−1.70	1,325	.00	2,580	5.00	8,240
−3.30	425	−1.60	1,390	.20	2,755	6.00	9,620
−3.20	470	−1.50	1,455	.40	2,935	7.00	11,060
−3.10	520	−1.40	1,520	.60	3,115	8.00	12,540
−3.00	570	−1.30	1,590	.80	3,305	9.00	14,040
−2.90	620	−1.20	1,660	1.00	3,500	10.00	15,590
−2.80	675	−1.10	1,730	1.20	3,700	11.00	17,170
−2.70	730	−1.00	1,800	1.40	3,900	12.00	18,800
−2.60	785	− .90	1,870	1.60	4,110	13.00	20,500
−2.50	840	− .80	1,940	1.80	4,320	14.00	22,200
−2.40	895	− .70	2,015	2.00	4,540	15.00	23,900
−2.30	950	− .60	2,090	2.20	4,760	16.00	25,600
−2.20	1,010	− .50	2,170	2.40	4,990	17.00	27,300
−2.10	1,070	− .40	2,250	2.60	5,220	18.00	29,000
−2.00	1,130	− .30	2,330	2.80	5,450		
−1.90	1,195	− .20	2,410	3.00	5,680		

NOTE.—The above table is based on five discharge measurements made during 1906, and on ter b water measurements made before 1906. It is well defined below gage height 0.0 feet. Above gage he 12 feet the rating curve is a tangent, the difference being 170 per tenth.

Monthly discharge of Tombigbee River at Columbus, Miss., for 1906.

[Drainage area, 4,440 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dept inch
January	17,200	4,220	9,090	2.05	
February	6,660	1,590	2,630	.592	
March	28,500	2,500	12,900	2.91	
April	29,300	1,520	7,480	1.68	
May	15,000	950	4,220	.950	
June	2,090	425	909	.205	
July	6 540	340	1,580	.356	
August	1,460	470	790	.178	
September	13,300	340	1,630	.367	
October	19,300	950	6,800	1.53	
November	11,200	730	3,520	.793	
December	9,620	1,590	4,520	1.02	
The year	29,300	340	4,670	1.05	

NOTE.—Values are rated as follows: June and August, good; remainder of 1906, excellent

TOMBIGBEE RIVER AT EPES, ALA.

This station was established November 29, 1904. It is locate the bridge of the Alabama Great Southern Railway, one-half from Epes, Ala. The conditions at this station and the bench m

described in Water-Supply Paper No. 168, page 139, where are n also references to publications that contain data for previous s.

Discharge measurements of Tombigbee River at Epes, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
nber 24	M. R. Hall	125	786	1.39	1,290
er 27	W. E. Hall	175	1,300	4.03	3,190

Daily gage height, in feet, of Tombigbee River at Epes, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	11.2	14.1	12.7	39.9	4.45	2.95	1.4	4.3	1.1	21.0	2.55	5.7
	11.0	11.6	11.6	39.9	3.75	2.7	1.2	2.95	1.05	22.5	2.85	5.2
	12.2	9.5	13.1	40.2	3.85	2.45	1.0	2.65	0.95	24.0	2.2	4.9
	18.6	8.0	12.9	40.4	4.6	2.3	0.85	2.2	.9	24.4	2.2	4.15
	21.4	7.2	13.2	40.5	[illegible]	2.7	.85	3.1	.9	25.1	2.1	3.75
	22.4	6.4	12.6	40.2	12.4	3.15	.95	2.9	.8	25.2	2.0	3.7
	21.9	5.8	12.4	39.1	17.2	3.3	.95	2.65	.6	31.4	1.9	3.6
	21.3	5.3	12.6	36.8	19.2	3.0	.95	2.15	.6	33.1	1.9	3.65
	21.0	5.0	11.8	32.6	20.0	2.65	.95	1.65	.55	33.2	1.85	3.9
	20.4	4.7	10.3	27.0	19.2	2.45	1.1	1.4	.8	32.6	1.8	5.4
	18.4	4.5	9.2	22.2	17.5	2.25	1.1	1.5	1.35	31.0	1.75	8.6
	15.6	4.3	8.2	18.2	15.3	2.05	1.35	1.45	1.25	29.1	1.7	11.2
	13.6	4.2	7.6	14.5	12.6	1.85	1.4	1.8	1.1	25.9	1.7	11.6
	12.9	4.2	7.2	12.0	9.2	1.8	1.9	2.15	1.1	21.2	1.7	9.9
	12.0	4.1	6.8	8.8	6.6	1.65	5.8	2.65	1.0	15.1	1.65	8.7
	11.2	4.2	9.7	7.6	4.95	1.6	4.7	2.35	.9	10.7	1.55	8.3
	10.2	4.35	14.2	7.1	4.2	2.15	4.3	2.55	.8	6.8	1.45	8.2
	9.3	4.4	17.0	6.8	3.7	2.85	10.2	2.7	.8	5.8	1.85	10.4
	8.6	4.35	35.1	6.5	3.45	2.6	14.4	2.5	.8	5.0	3.0	12.0
	8.4	4.15	39.8	6.0	3.15	2.1	12.8	2.45	.8	4.5	6.2	12.6
	8.4	4.25	41.2	6.2	2.9	1.8	11.4	2.3	.8	4.9	9.8	12.8
	18.0	4.4	41.6	5.3	2.9	1.55	9.4	1.95	.7	5.3	11.8	12.8
	22.3	4.4	41.7	4.9	2.6	1.35	7.5	1.8	.7	5.5	13.0	12.4
	21.3	5.6	41.6	4.75	2.65	1.2	6.4	1.65	1.45	5.4	13.4	11.6
	21.2	9.4	41.3	4.55	2.7	1.2	5.8	1.7	2.55	5.0	13.2	10.6
	20.6	10.7	40.6	4.4	2.75	1.75	4.65	1.5	3.35	4.4	12.2	9.6
	20.0	12.4	38.4	4.2	3.2	2.65	3.7	1.25	4.9	4.0	11.1	8.6
	19.6	12.8	38.6	3.85	3.65	2.1	3.1	1.15	12.7	3.6	8.9	7.8
	18.6	.....	38.7	3.8	3.75	1.75	2.85	1.05	17.6	3.3	8.0	7.2
	17.2	.....	39.2	3.9	3.55	1.45	4.45	1.1	19.5	3.0	7.0	7.7
	15.3	.....	39.7	.....	3.3	.....	5.5	1.15	.....	2.75	.....	16.2

Rating table for Tombigbee River at Epes, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.50	770	1.80	1,480	3.10	2,370	4.80	3,870
0.60	810	1.90	1,540	3.20	2,450	5.00	4,060
0.70	850	2.00	1,600	3.30	2,530	5.20	4,250
0.80	900	2.10	1,660	3.40	2,610	5.40	4,450
0.90	950	2.20	1,725	3.50	2,690	5.60	4,652
1.00	1,000	2.30	1,790	3.60	2,780	5.80	4,856
1.10	1,060	2.40	1,855	3.70	2,870	6.00	5,060
1.20	1,120	2.50	1,925	3.80	2,960	6.20	5,268
1.30	1,180	2.60	1,995	3.90	3,050	6.40	5,476
1.40	1,240	2.70	2,065	4.00	3,140	6.60	5,684
1.50	1,300	2.80	2,140	4.20	3,320	6.80	5,892
1.60	1,360	2.90	2,215	4.40	3,500	7.00	6,100
1.70	1,420	3.00	2,290	4.60	3,680		

OTE.—The above table is based on nine discharge measurements made during 1904-1906, and is well ed between gage heights 0.9 feet and 15.6 feet. Above gage height 6 feet the rating curve is a tan-, the difference being 104 per tenth.

Monthly discharge of Tombigbee River at Epes, Ala., for 1906.

[Drainage area, 8,830 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
January	22,100	7,560	15,800	1.79	
February	13,500	3,230	5,720	.648	
March	42,200	5,890	23,000	2.60	
April	40,900	2,960	17,300	1.96	
May	19,600	2,000	6,570	.744	
June	2,530	1,120	1,730	.196	
July	13,800	975	3,810	.432	
August	3,410	1,030	1,680	.190	
September	19,100	790	2,660	.301	
October	33,300	2,100	14,900	1.69	
November	12,800	1,270	4,550	.515	
December	15,700	2,780	7,670	.869	
The year	42,200	790	8,780	.995	

NOTE.—Values for 1906 are excellent.

BLACK WARRIOR RIVER NEAR CORDOVA, ALA.

This station is located at the Kansas City, Memphis and Birm ham Railroad bridge, which crosses the river below the junctio Mulberry and Sipsey forks and about three-fourths mile from dova, Ala. The gage was established by the United States Wea Bureau. The conditions at this station and the bench marks described in Water-Supply Paper No. 168, page 142, where are g also references to publications that contain data for previous y

Discharge measurements of Black Warrior River near Cordova, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	I ch
		Feet.	*Sq. ft.*	*Feet.*	*Se*
April 20	F. A. Murray	170	1,210	1.05	
April 27	do	168	1,120	0.71	
June 22	do	165	967	−0.28	
June 23	do	180	573	−0.33	

Daily gage height, in feet, of Black Warrior River near Cordova, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.4	2.7	1.9	14.2	0.4	1.1	−.6	0.6	0.1	13.0	0.1
2	3.0	2.4	1.6	9.8	.45	.8	−.6	.45	1.1	17.0	.0
3	6.9	2.1	8.0	7.2	.4	.65	−.6	.2	1.0	12.0	.0
4	14.0	1.85	14.6	5.6	.8	.9	−.65	.1	.9	9.4	.0
5	11.0	1.6	8.7	4.3	2.4	1.1	−.65	.1	1.1	6.1	.05
6	6.8	1.5	6.8	3.8	2.2	.9	−.65	.0	1.0	8.6	.05
7	5.3	1.4	5.7	3.4	2.0	.7	−.65	.0	1.0	13.9	.05
8	4.6	1.3	4.4	3.1	1.6	.5	−.6	.1	.9	9.5	.05
9	4.6	1.2	3.8	2.9	1.1	.4	−.6	−.1	.8	6.4	.1
10	4.3	1.15	3.3	2.85	.8	.4	−.5	−.1	.6	3.8	.1
11	4.0	1.0	2.6	2.8	.5	.35	−.4	−.2	.4	2.9	.05
12	4.6	.9	2.15	2.5	.3	.3	−.5	3.1	.3	2.2	.05
13	5.6	.9	2.1	2.3	.3	.2	−.6	3.4	.2	1.0	.05
14	4.8	1.0	2.0	2.1	.25	.15	+5.7	3.6	.5	1.2	.0
15	4.6	1.05	22.0	2.1	.2	.2	6.6	3.9	.4	1.0	.02

ly gage height, in feet, of Black Warrior River near Cordova, Ala., for 1906—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	3.8	1.0	24.0	1.9	.1	.6	4.6	2.8	.0	.8	.05	1.1
.....	3.2	1.0	14.3	1.8	.0	.4	2.6	1.7	− .2	.7	.05	1.0
.....	3.0	.85	8.5	1.65	.0	.2	9.8	1.1	− .3	.9	.5	1.8
.....	2.8	.7	15.5	1.4	− .05	.1	6.7	.9	.0	3.8	3.4	1.5
.....	2.65	.6	22.7	1.2	− .1	.0	3.6	.6	+ .1	3.2	7.2	2.7
.....	2.9	1.3	15.2	1.0	.0	− .25	3.2	.4	.3	2.1	4.7	2.3
.....	18.5	2.0	8.0	1.2	+ .2	− .3	2.0	.2	.4	1.5	3.2	2.0
.....	34.2	2.0	7.6	1.5	.4	− .4	1.6	.1	1.8	1.2	2.8	1.7
.....	27.9	1.9	6.0	1.2	.5	− .4	3.2	.1	1.2	1.0	2.0	1.5
.....	14.6	4.1	5.2	1.0	.8	− .55	2.3	.0	.7	.7	1.5	1.2
.....	9.4	3.2	4.0	0.85	4.2	− .5	1.5	− .1	.6	.5	1.2	1.0
.....	6.2	2.5	5.6	.7	3.9	− .4	1.0	− .1	.9	.3	1.1	.9
.....	5.1	2.6	24.5	.5	3.1	− .5	.6	.9	1.2	.3	1.0	1.7
.....	4.2	.....	19.5	.5	2.6	− .6	.6	2.1	17.0	.3	.9	2.6
.....	3.6	.....	21.1	.45	2.2	− .5	1.5	1.0	20.5	.2	.7	3.1
.....	3.0	.....	21.5	.....	1.7	.....	1.1	.4	.....	.2	.....	14.5

Rating table for Black Warrior River near Cordova, Ala., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
−0.70	110	0.80	1,170	2.30	2,715	4.60	5,500
−0.60	145	0.90	1,265	2.40	2,830	4.80	5,820
−0.50	190	1.00	1,360	2.50	2,945	5.00	6,080
−0.40	240	1.10	1,455	2.60	3,060	5.20	6,340
−0.30	300	1.20	1,550	2.70	3,175	5.40	6,600
−0.20	365	1.30	1,650	2.80	3,290	5.60	6,870
−0.10	430	1.40	1,750	2.90	3,405	5.80	7,150
0.00	500	1.50	1,850	3.00	3,525	6.00	7,430
0.10	575	1.60	1,955	3.20	3,765	7.00	8,830
0.20	650	1.70	2,060	3.40	4,005	8.00	10,230
0.30	730	1.80	2,165	3.60	4,260	9.00	11,650
0.40	810	1.90	2,270	3.80	4,520	10.00	13,150
0.50	895	2.00	2,380	4.00	4,780	11.00	14,650
0.60	985	2.10	2,490	4.20	5,040		
0.70	1,075	2.20	2,600	4.40	5,300		

E.—The above table is based on discharge measurements made during 1900-1906 and is well defined gage height 14 feet. Above gage height 8.8 feet it is a tangent, the difference being 150 per tenth.

Monthly discharge of Black Warrior River near Cordova, Ala., for 1906.

[Drainage area, 1,900 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ary	49,400	3,120	9,860	5.19	5.98
uary	4,910	985	2,040	1.07	1.11
ch	34,900	1,960	13,700	7.21	8.31
il	19,400	852	3,620	1.91	2.13
	5,040	430	1,530	.805	.93
	1,460	145	680	.358	.40
	12,800	128	2,400	1.26	1.45
ust	4,650	365	1,350	.71	.82
tember	28,900	300	2,700	1.42	1.58
ober	23,600	650	5,390	2.84	3.27
ember	9,110	500	1,560	.821	.92
ember	19,900	810	2,270	1.19	1.37
The year	49,400	128	3,930	2.07	28.27

OTE.—Values are rated as follows: June, good; remainder of 1906, excellent.

MISCELLANEOUS MEASUREMENTS IN MOBILE RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in Mobile River drainage basin during 1906:

Etowah River near Canton, Ga.—A measurement was made February 23, 1906, at Field's bridge, a single-span iron highway bridge, [illegible] miles downstream from Canton, Ga. The bench mark is a chisel cut on the right side of the intermediate post, 145 feet from the right end of the bridge, downstream side; elevation, 36 feet above the datum of the assumed gage.

Width, 132 feet; area, 613 square feet; gage height, 4.94 feet; discharge, 1,[illegible] second-feet.

Little River near Toonigh, Ga.—Measurements were made from a boat at a point about 300 feet downstream from Little River Mills. The bench mark is a nail in a willow tree which stands on right bank about 50 feet below the old rope ferry landing; elevation, 5 feet above the datum of the assumed gage.

February 23: Width, 40 feet; area, 76 square feet; gage height, 3.00 feet; discharge, 143 second-feet.

February 24: Width, 40 feet; area, 74 square feet; gage height, 2.97 feet; discharge, 133 second-feet.

Toonigh Creek near Toonigh, Ga.—A measurement was made February 24, 1906, from the foot plank at a point about 150 feet above the mouth of the creek. The bench mark is a nail driven into the water side of an ash tree on the right bank at the mouth of the creek; elevation, 9 feet above the datum of the assumed gage.

Width, 7.5 feet; area, 5.1 square feet; gage height, 1.42 feet; discharge, 8.8 second-feet.

Noonday Creek near Toonigh, Ga.—A measurement was made February 24, 1906, from the foot log, about one-fourth mile above the mouth of the creek. The bench mark is a nail driven into the water side of a 3-pronged ironwood tree on the right bank about 70 feet below the foot log; elevation, 4.60 feet above the datum of the assumed gage.

Width, 22 feet; area, 40 square feet; gage height, 2.60 feet; discharge, 58 second-feet.

Big Cedar Creek near Cavespring, Ga.—This stream enters Coosa River 6 miles northwest of Cavespring. A measurement was made May 14, 1906, at the bridge, 2½ miles northeast of Cavespring. The bench mark is the top of the second iron floor beam from the right end of the bridge, upstream side; elevation, 17 feet above the datum of the assumed gage.

Width, 77 feet; area, 230 square feet; gage height, 3.32 feet; discharge, 124 second-feet.

A measurement was made May 14, 1906, from a single-span iron wagon bridge, 3 miles north of Cavespring, near Wetsels Ford. The bench mark is the top of the upstream end of the second cross beam from the right end of the bridge; elevation, 20 feet above the datum of the assumed gage.

Width, 61 feet; area, 239 square feet; gage height, 2.92 feet; discharge, 161 second-feet.

Little Cedar Creek at Cavespring, Ga.—A measurement was made May 14, 1906, at a single-span iron footbridge on the road to the Cave Spring on the main street of the city. The bench mark is the top of the downstream end of the first iron cross beam from the right end of the bridge; elevation, 8 feet above the datum of the assumed gage.

Width, 32 feet; area, 14.7 square feet; gage height, 1.26 feet; discharge, 21.7 second-feet.

A measurement was made May 14, 1906, at a wagon bridge one-fourth mile north of Cavespring, Ga. The bench mark is the top of the downstream end of the first cross beam from the left end of the bridge; elevation, 7 feet above the datum of the assumed gage.

Width, 31 feet; area, 15 square feet; gage height, 1.01 feet; discharge, 31 second-feet.

Cave Spring near Cavespring, Ga.—A measurement was made May 14, 1906, at the footbridge, about 15 feet from the spring.

Width, 16 feet; area, 7 square feet; discharge, 4.5 second feet.

Tallapoosa River near Tallapoosa, Ga.—A measurement was made June 29, 1906, at Buchanan Bridge, about 4 miles north of Tallapoosa, Ga. The bench mark is the top of the downstream end of the center floor beam, the third from either end; elevation, 25.25 feet above the datum of the assumed gage.

Width, 41 feet; area, 101 square feet; gage height, 1.09 feet; discharge, 97 second-feet.

A measurement was made June 29, 1906, at Adderhold Bridge, about 2 miles north of Tallapoosa, Ga., and about 2 miles below Buchanan Bridge. The bench mark is the top of the downstream end of the first floor beam from the left bank; elevation, 22 feet above the datum of the assumed gage.

Width, 81 feet; area, 216 square feet; gage height, 0.93 feet; discharge, 146 second-feet.

Tallapoosa River near Heflin, Ala.—A measurement was made June 28, 1906, at Denman's wagon bridge, about 7 miles southwest of Heflin, Ala., on the road to Wedowee, Ala. The bench mark is the top of the downstream end of the cap beam of the center pile bent of the bridge; elevation, 24 feet above the datum of the assumed gage.

Width, 127 feet; area, 412 square feet; gage height, 2.90 feet; discharge, 452 second-feet.

Tallapoosa River at Luoina, Ala.—A measurement was made June 23, 1906, from the Louina highway bridge.

Width, 238 feet; area, 1,510 square feet; discharge, 1,300 second-feet.

Tallapoosa River near Dadeville, Ala.—A measurement was made June 21, 1906, from a ferryboat at Germany Ferry, 7 miles northeast of Dadeville, Ala. The Geodetic Survey bench mark was used in getting the elevation of water surface. It is located on the right bank of the river on a large water-oak tree; elevation, 22 feet above the datum of the assumed gage.

Width, 337 feet; area, 1,820 square feet; gage height, 5.63 feet; discharge, 1,780 second-feet.

A measurement was made June 20, 1906, from a ferryboat at Millers Ferry, 6 miles north of Dadeville, Ala. The bench mark is a spike driven into a water-oak tree on the east side of the road, 20 feet from the left bank of the river; elevation, 24 feet above the datum of the assumed gage.

Width, 357 feet; area, 4,370 square feet; gage height, 15 feet; discharge, 1,960 second-feet.

Highpine Creek at Liles Mill, Ala.—A measurement was made June 22, 1906, at a point about 150 feet below Liles Mill dam. The bench mark is a cut in the top of the bridge flooring just east of the first pier from the left bank; elevation, 16 feet above the datum of the assumed gage.

Width, 32 feet; area, 80 square feet; gage height, 2.90 feet; discharge, 67 second-feet.

Chickasanocsa Creek near Hampton, Ala.—A measurement was made June 22, 1906, by wading, at Leveretts Bridge, about 150 feet below the mill dam.

Width, 49 feet; area, 63 square feet; discharge, 54 second-feet.

Chattahaspee Creek near Hampton, Ala.—A measurement was made June 22, 1906, from Smiths Bridge, 1 mile west of the county line between Tallapoosa and Chambers counties. The bench mark is a cut in the top of the bridge flooring in the middle of the second crib from the left bank; elevation, 8 feet above the datum of the assumed gage.

Width, 34 feet; area, 171 square feet; gage height, 4.50 feet; discharge, 66 second-feet.

Emuckfaw Creek at Hamlet, Ala.—A measurement was made June 21, 1906, by wading, near Hamlet's mill. The bench mark is the top of the cap of the second pier from the west side of the bridge; elevation, 18 feet above the datum of the assumed gage.

Width, 35 feet; area, 29 square feet; gage height, 1.20 feet; discharge, 65 second-feet.

Sandy Creek near Camphill, Ala.—A measurement was made June 26, 1906, from a foot log about 1 mile above the forks of the creek.

Width, 31 feet; area, 93 square feet; discharge, 23 second-feet.

Sandy Creek near Dadeville, Ala.—A measurement was made June ;, 1906, at Smiths Bridge.

Width, 97 feet; area, 93 square feet; discharge, 118 second-feet.

South Fork Sandy Creek near Camphill, Ala.—A measurement was ıde June 26, 1906, from a highway bridge near Bulger's mill. The nch mark is the top of the floor on the south side of the second pier ım the south side of the creek; elevation, 8 feet above the datum of ? assumed gage.

Width, 49 feet; area, 46 square feet; gage height, 1.50 feet; discharge, 47 second-feet.

Little Sandy Creek near Camphill, Ala.—A measurement was made ne 26, 1906, at a highway bridge which crosses the creek just above e railroad bridge. The bench mark is the top of the cap of the first nt from the right bank of the river; elevation, 8 feet above the datum the assumed gage.

Width, 27 feet; area, 51 square feet; gage height, 3.90 feet; discharge, 21 second-feet.

North Fork Sandy Creek near Dadeville, Ala.—A measurement was ade June 26, 1906, by wading, about 150 feet below Duncan's bridge.

Width, 29 feet; area, 25 square feet; discharge, 25 second-feet.

Timbercut Creek near Dadeville, Ala.—A measurement was made June), 1906, at a foot log about 1 mile above the mouth of the creek at a ırd on the road to Welch Ferry.

Width, 24 feet; area, 27 square feet; discharge, 22 second-feet.

Blue Creek at Susanna, Ala.—A measurement was made June 25, 906, at the highway bridge.

Width, 27 feet; area, 40 square feet; discharge, 22 second-feet.

Wind Creek near Meltons Mill, Ala.—A measurement was made June ;, 1906, at Ledbetters Bridge. The creek was at a low stage.

Width, 13 feet; area, 11 square feet; discharge, 9 second-feet.

Sougahatchee Creek near Thaddeus, Ala.—A measurement was made ıne 25, 1906, from Loveladys Bridge. The bench mark is the top the cap on the north side of the main bent, upstream side; elevaon, 28 feet above the datum of the assumed gage.

Width, 77 feet; area, 107 square feet; gage height, 4.10 feet; discharge, 103 second-et.

Buttahatchee River near Columbus, Miss.—A measurement was made pril 26, 1906, at a covered wooden wagon bridge 15 miles north of ılumbus, Miss., on the road to Aberdeen, Miss. The bench mark the top of the upstream end of the second wooden crossbeam from e left bank wooden trestle pier; elevation, 23 feet above the datum the assumed gage.

Width, 108 feet; area, 507 square feet; gage height, 6.76 feet; discharge, 587 second-t.

Luxapelila Creek near Columbus, Miss.—A measurement was made April 23, 1906, at a single-span iron highway bridge at the Columbus waterworks. The bench mark is the top of the upstream end of the crossbeam 90 feet from the right end of the bridge; elevation, 26.45 feet above the datum of the assumed gage.

Width, 96 feet; area, 646 square feet; gage height, 3.20 feet; discharge, 312 second-feet.

Tibbee River near West Point, Miss.—A measurement was made April 26, 1906, at a single-span iron highway bridge 3 miles southwest of West Point and about 600 feet downstream from the Illinois Central Railroad bridge. The bench mark is the top of the upstream end of an iron crossbeam, 31 feet from the left end of the bridge; elevation, 28 feet above the datum of the assumed gage.

Width, 56 feet; area, 248 square feet; gage height, 5.94 feet; discharge, 227 second-feet.

A measurement was made April 24, 1906, from a single-span iron highway bridge 5 miles south of West Point, Miss., and about 500 feet above the Mobile and Ohio Railroad bridge. The bench mark is the top of the upstream end of the second iron crossbeam from the right end of the bridge; elevation, 32 feet above the datum of the assumed gage.

Width, 52 feet; area, 140 square feet; gage height, 4.88 feet; discharge, 238 second-feet.

Sahatonchee Creek near West Point, Miss.—A measurement was made April 24, 1906, from a two-span iron highway bridge 3 miles west of West Point, Miss. The bench mark is the top of the upstream end of an iron crossbeam 90 feet from the left end of the bridge; elevation, 25 feet above the datum of the assumed gage.

Width, 96 feet; area, 168 square feet; gage height, 3.48 feet; discharge, 125 second-feet.

Oaknoxubee River near Macon, Miss.—A measurement was made April 25, 1906, at a single-span iron highway bridge one-fourth mile south of Macon. The bench mark is the top of the upstream end of an iron cross-beam 68 feet from the left bank end of the hand rail; elevation, 37 feet above the datum of the assumed gage.

Width, 51 feet; area, 229 square feet; gage height, 6.42 feet; discharge, 173 second-feet.

PEARL RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Pearl River rises in the eastern part of Mississippi. It flows south into Lake Borgne, an arm of the Gulf of Mexico, forming part of the boundary between Louisiana and Mississippi.

PEARL RIVER AT JACKSON, MISS.

station was established June 24, 1901. It is located at a high-ridge, 2 miles from the union station at Jackson, Miss., one-mile above the Alabama and Vicksburg Railroad, and two east from the end of the South State street car line. The con- at this station and the bench marks are described in Water- · Paper No. 168, page 152, where are given also references to ations that contain data for previous years.

Discharge measurements of Pearl River at Jackson, Miss., in 1906.

.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	W. E. Hall	891	7,010	23.47	9,120
.....	do	119	579	3.24	898
r21..	M. R. Hall	106	381	1.66	429

a Discharge affected by backwater.

Daily gage height, in feet, of Pearl River at Jackson, Miss., for 1906.

r.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	6.4	10.0	4.8	28.8	3.2	6.3	2.3	2.1	1.0	21.3	3.0	3.5
.....	6.7	8.8	5.4	28.4	3.3	6.8	2.4	2.0	1.0	21.6	2.8	3.4
.....	9.2	7.9	5.7	27.8	3.3	6.8	2.2	2.0	1.0	21.6	2.7	3.2
.....	11.8	7.2	5.9	27.1	4.7	6.7	2.0	2.5	1.0	21.7	2.6	2.9
.....	11.5	6.8	6.2	26.6	8.1	6.6	1.9	2.9	2.1	23.4	2.5	2.7
.....	11.3	6.4	6.2	26.0	9.7	6.0	1.8	3.3	1.2	26.4	2.4	2.5
.....	10.4	5.9	6.1	25.4	12.6	5.4	1.7	3.6	1.4	27.6	2.3	2.4
.....	10.8	5.4	6.0	24.8	14.9	4.9	1.7	3.7	2.4	28.3	2.2	2.3
.....	10.7	4.7	5.9	23.4	15.5	4.1	1.7	3.7	2.8	28.6	2.1	2.3
.....	10.6	4.3	5.8	21.9	15.9	3.6	1.7	3.6	3.2	29.0	2.1	2.4
.....	10.7	4.2	5.6	20.1	15.7	3.1	2.6	3.5	3.2	29.6	2.0	3.5
.....	11.1	3.8	5.4	18.5	15.3	2.8	2.7	3.3	3.0	30.0	1.9	2.8
.....	11.0	3.7	5.0	15.4	14.9	2.6	2.9	2.9	3.1	30.1	1.9	4.1
.....	10.6	3.6	4.8	13.2	14.7	2.5	2.3	2.2	3.2	29.8	1.9	5.8
.....	10.1	3.5	4.5	9.8	14.0	2.4	2.2	2.1	2.8	29.3	1.9	7.0
.....	9.4	3.3	4.1	8.9	12.7	2.3	2.1	2.1	2.2	28.4	1.9	8.1
.....	9.2	3.3	3.7	8.1	10.9	2.2	2.4	2.0	1.9	27.4	1.8	8.5
.....	9.0	3.3	3.9	7.6	8.9	2.1	3.9	1.9	1.8	26.2	1.9	8.2
.....	8.7	3.3	17.9	7.1	7.6	2.2	3.5	1.9	1.8	24.6	2.3	7.4
.....	8.3	3.3	23.2	6.7	6.5	2.2	3.7	1.8	1.7	23.1	2.3	7.1
.....	7.9	3.2	24.9	6.1	6.0	2.1	4.3	1.7	1.7	20.0	2.2	7.0
.....	10.1	3.2	25.2	6.6	5.2	2.0	4.4	1.7	1.7	16.5	2.2	7.0
.....	12.6	3.2	25.0	5.1	4.5	1.9	4.6	1.6	1.7	11.1	2.6	6.9
.....	13.2	4.0	25.2	4.7	4.1	1.8	4.3	1.5	1.8	7.5	3.2	6.8
.....	14.1	4.6	26.4	4.4	3.8	1.8	4.0	1.4	2.0	6.0	3.5	6.7
.....	14.5	3.8	27.2	4.0	3.5	1.7	3.6	2.5	2.2	5.1	3.7	6.5
.....	14.1	4.0	27.8	3.8	3.6	2.0	3.3	2.0	4.1	4.5	3.8	6.2
.....	12.1	4.4	29.0	3.5	3.6	1.8	3.0	1.4	16.4	4.0	3.8	5.9
.....	11.6	.....	29.8	3.4	4.0	2.0	2.7	1.3	19.4	3.6	3.7	5.4
.....	11.2	.....	29.6	3.3	4.7	2.4	2.4	1.2	20.8	3.4	3.6	5.6
.....	10.8	.....	29.4	.....	5.7	.....	2.2	1.0	.....	3.1	.....	7.8

Rating table for Pearl River at Jackson, Miss., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	320	2.80	732	5.20	1,870	16.00	8,700
1.10	335	2.90	770	5.40	1,980	17.00	9,500
1.20	350	3.00	810	5.60	2,090	18.00	10,300
1.30	366	3.10	852	5.80	2,200	19.00	11,100
1.40	383	3.20	894	6.00	2,310	20.00	12,000
1.50	400	3.30	938	6.20	2,420	21.00	12,900
1.60	418	3.40	984	6.40	2,530	22.00	13,900
1.70	436	3.50	1,030	6.60	2,640	23.00	15,000
1.80	455	3.60	1,078	6.80	2,750	24.00	16,200
1.90	475	3.70	1,126	7.00	2,860	25.00	17,500
2.00	495	3.80	1,174	8.00	3,435	26.00	19,000
2.10	518	3.90	1,223	9.00	4,035	27.00	20,700
2.20	543	4.00	1,272	10.00	4,635	28.00	22,600
2.30	570	4.20	1,370	11.00	5,285	29.00	24,500
2.40	599	4.40	1,470	12.00	5,935	30.00	26,400
2.50	630	4.60	1,570	13.00	6,600		
2.60	662	4.80	1,670	14.00	7,300		
2.70	696	5.00	1,770	15.00	8,000		

NOTE.—The above table is based on discharge measurements made during 1903-1906 and is i well defined.

Monthly discharge of Pearl River at Jackson, Miss., for 1906.

[Drainage area, 3,120 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
January	7,650	2,530	5,090	1.63	
February	4,640	894	1,690	.542	
March	26,000	1,130	9,520	3.05	
April	24,100	938	8,940	2.87	
May	8,630	894	3,910	1.25	
June	2,750	436	1,130	.362	
July	1,570	436	788	.253	
August	1,130	320	616	.197	
September	12,700	320	1,620	.519	
October	26,600	852	14,400	4.62	
November	1,170	455	686	.220	
December	3,740	570	1,960	.628	
The year	26,600	320	4,200	1.35	1

NOTE.—Values are rated as follows: March, April, and October, fair; remainder of the year excel There is liable to be gorging at this station for stages above about 15 feet. This probably does always occur and usually lasts only a few days.

BOGUE CHITTO AT WARNERTON, LA.

On April 28, 1906, a station was established on this stream, locat at the Kentwood and Eastern Railroad bridge, one-fourth mile west Warnerton, La. The gage is a vertical rod attached to the brid piling on the upstream side of the bridge, about 15 feet from the l bank. The gage was read for a short while only by J. W. Warner

The current is moderately slow and is broken by the wooden pi and a number of trestle bents.

The bench mark is the top of the right bank end of the lower ch of the wooden truss, downstream side of the bridge; elevation, 23 feet above the datum of the gage.

A measurement was made April 27, 1906, by W. E. Hall, with the following results:

Width, 111 feet; area, 823 square feet; gage height, 2.90 feet; discharge, 571 second-feet.

Daily gage height, in feet, of Bogue Chitto River at Warnerton, La., for 1906.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
		2.9	4.9	2.7	17		2.7	2.8	3.6
		2.9	4.4	2.7	18		2.7	2.8	3.4
		2.8	4.2	2.8	19		2.7	2.8	3.2
		2.8	3.9	2.8	20		2.7	2.7	3.1
		2.8	3.7	2.9	21		2.7	2.7	3.0
		2.8	3.5	3.0	22		2.7	2.7	3.0
		2.8	3.2	3.1	23		3.8	2.8	2.9
		2.8	3.0	3.0	24		4.6	2.8	2.9
		2.8	3.0	2.9	25		4.9	2.9	2.8
		2.8	2.9	2.9	26		5.2	2.9	2.8
		2.8	2.8	2.8	27	2.9	5.2	2.8	2.7
		2.7	2.8	2.8	28	2.9	5.9	2.8	2.7
		2.7	2.8	2.7	29	3.0	5.8	2.7	2.7
		2.7	2.8	2.7	30	3.0	5.7	2.7	2.7
		2.7	2.8	2.9	31		5.3		2.7
		2.7	2.8	3.2					

LAKE PONTCHARTRAIN DRAINAGE BASIN.

MISCELLANEOUS MEASUREMENTS.

The following is a list of miscellaneous discharge measurements made in Lake Pontchartrain drainage basin during 1906:

Tangipahoa River near Kentwood, La.—A measurement was made April 27, 1906, at the Kentwood and Eastern Railroad bridge. The bench mark is the top of the downstream end of the cap of the fourth bent from the right bank; elevation, 13 feet above the datum of the assumed gage.

Width, 88 feet; area, 310 square feet; gage height, 3.75 feet; discharge, 242 second-feet.

Tangipahoa River near Tangipahoa, La.—A measurement was made June 20, 1906, at a wooden highway bridge 1 mile east of Tangipahoa, La. The bench mark is the top of the downstream end of the right bent of the middle of a wooden pier; elevation, 15 feet above the datum of the assumed gage.

Width, 96 feet; area, 324 square feet; gage height, 3.60 feet; discharge, 242 second-feet.

Tangipahoa River near Amite, La.—A measurement was made April 25, 1906, from the steel wagon bridge 1 mile from Amite, La. The bench mark is the top of the outer eyebar of the lower chord on the upstream side of the bridge, at a point 1 foot to the right of the

first intermediate post from the right bank pier; elevation, 18 feet above the datum of the assumed gage.

Width, 133 feet; area, 470, square feet; gage height, 2.57 feet; discharge, 462 second-feet.

Tickfaw River near Montpelier, La.—A measurement was made April 26, 1906, at a wooden wagon bridge 1 mile east of Montpelier and about 9 miles west of Amite. The bench mark is the top of the downstream end of the cap of the second bent from the right end of the bridge; elevation, 14 feet above the datum of the assumed gage.

Width, 90 feet; area, 213 square feet; gage height, 2.65 feet; discharge, 155 second-feet.

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1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
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1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
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1905. East of Mississippi River, Watter-Supply Papers Nos. 165*, 166*, 167, 168*, 169, 170, and 171.
West of Mississippi River, Water-Supply Papers Nos. 171, 172*, 173*, 174, 175*, 176, 177, and 178.
1906. East of Mississippi River, Water-Supply Papers Nos. 201, 202, 203, 204, 205, 206, and 207.
West of Mississippi River, Water-Supply Papers Nos. 207 208, 209, 210, 211, 212, 213, and 214.

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THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

JULY, 1907.

O

Water-Supply and Irrigation Paper No. 205 Series P, Hydrographic Progress Reports, 59

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY

OF

OHIO AND LOWER EASTERN MISSISSIPPI RIVER DRAINAGES, 1906

M. R. HALL, N. C. GROVER, and A. H. HORTON
DISTRICT HYDROGRAPHERS.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

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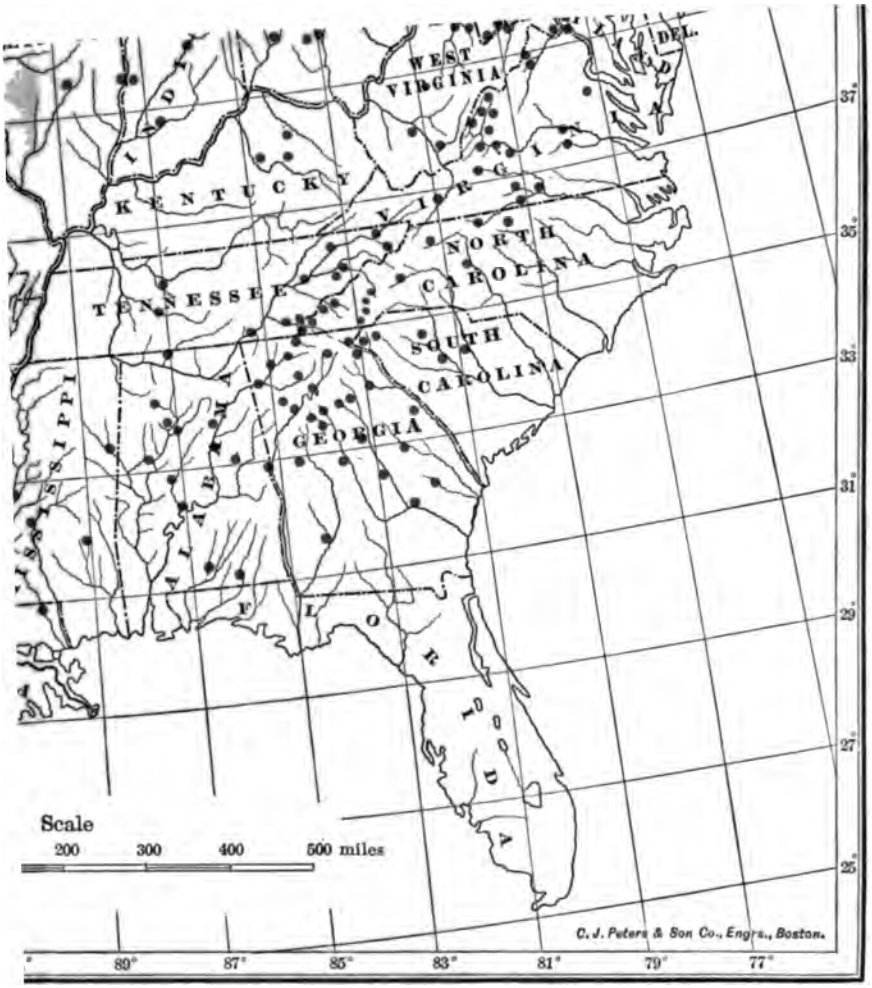

AINTAINED DURING 1906.

URFACE WATER SUPPLY OF THE OHIO AND LOWER EASTERN MISSISSIPPI RIVER DRAINAGES, 1906.[a]

M. R. HALL, N. C. GROVER, and A. H. HORTON,
District Hydrographers.[b]

INTRODUCTION.

SCOPE OF WORK.

The water supply of the United States is of more importance to the life and pursuits of the people than is any other natural resource. In the arid States the limit of agricultural development is determined by the amount of water available for irrigation, while in all parts of the country the increase in the population of cities and towns makes necessary additional water supplies for domestic and industrial uses, in procuring which both the quantity and the quality of the water that may be obtained must be considered. The location of manufacturing plants may depend largely on the water-power facilities and on the character of the water. The notable advances made in the electric transmission of power have led to the utilization of water powers for the operation of manufacturing establishments, railroads, and municipal lighting plants, many of which are at some distance from the places at which the power is developed.

The intelligent establishment and maintenance of enterprises or industries that depend on the use of water demands a thorough knowledge of the flow of the streams and an understanding of the conditions affecting that flow. This knowledge should be based on data showing both the total flow and the distribution of the flow throughout the year, in order that normal fluctuations may be provided for. As the flow of a stream is variable from year to year, estimates of future flow can be made only from a study of observations covering several years. The rapid increase in the development

[a] This report contains information similar to that published in previous years under the title "Report on Progress of Stream Measurements."

[b] The data presented in this paper have been collected as follows: Tennessee River drainage and lower eastern Mississippi River drainage by M. R. Hall, district hydrographer, assisted by W. E. Hall, O. P. Hall, and F. A. Murray; Ohio River drainage from the north by A. H. Horton, district hydrographer, assisted by M. S. Brennan and E. F. Kriegsman; Ohio River drainage from the south by N. C. Grover, district hydrographer.

The data have been prepared for publication under the direction of John C. Hoyt, by R. H. Bolster, Robert Follansbee, F. F. Henshaw, J. E. Stewart, and H. D. Padgett.

of the water resources of the United States has caused a great demand by engineers for information in regard to the flow of streams, as it is now generally realized that the failure of many large power, irrigation, and other projects has been due to the fact that the plans were made without sufficient trustworthy information in respect to the water supply.

Owing to the broad scope of these hydrographic investigations and the length of time they should cover in order that the records may be of greatest value, it is, in general, impossible for private individuals to collect the necessary data, and as many of the streams traverse more than one State this work does not properly fall within the province of the State authorities. The United States Geological Survey has therefore, by means of specific appropriations by Congress, for several years systematically made records of stream flow, with the view to ultimately determining all the important features governing the flow of the principal streams of the country. In carrying out this plan stations are established on the streams and maintained for a period long enough to show their regimen or general behavior. When a record that is sufficient for this purpose has been obtained for any stream, the work on that stream is discontinued. The order in which the streams are measured is determined by the degree of their importance.

During 1906 the regimen of flow was studied at about 700 stations distributed along the various rivers throughout the United States, as shown on Pl. I. In addition to these records, data in regard to precipitation, evaporation, water power, and river profiles were obtained in many sections of the country.

These data have been assembled by drainage areas and are published in a series of fourteen Water-Supply and Irrigation Papers, Nos. 201 to 214, inclusive, each of which pertains to the surface-water resources of a group of adjacent areas. In these papers are embodied not only the data collected in the field, but also the results of computations based on these data, and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc. The list follows:

Water-Supply and Irrigation Papers on Surface Water Supply, 1906.

201. Surface water supply of New England, 1906. (Atlantic coast of New England drainage.)
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river drainages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.)
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages.)

205. Surface water supply of the Ohio and lower eastern Mississippi river drainages, 1906.
206. Surface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
207. Surface water supply of the upper Mississippi River and Hudson Bay drainages, 1906.
208. Surface water supply of the Missouri River drainage, 1906.
209. Surface water supply of the lower western Mississippi River drainage, 1906.
210. Surface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
211. Surface water supply of the Colorado River drainage above Yuma, 1906.
212. Surface water supply of the Great Basin drainage, 1906.
213. Surface water supply of California, 1906. (The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage below Yuma.)
214. Surface water supply of the North Pacific Coast drainage, 1906.

The records at most of the stations discussed in these reports extend over a series of years. An index of the reports containing such records up to and including 1903 has been published in Water-Supply Paper No. 119. The following table gives, by years and primary drainage basins, the numbers of the papers on surface water supply, published from 1901 to 1906.

Numbers of Water-Supply Papers containing results of stream measurements, 1901–1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
Atlantic Coast of New England drainage	65, 75	82	97	124	165	201
Hudson, Passaic, Raritan, and Delaware river drainages	65, 75	82	97	125	166	202
Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages	65, 75	82, 83	97, 98	126	167	203
Santee, Savannah, Ogeechee, and Altamaha rivers, and eastern Gulf of Mexico drainages	65, 75	83	98	127	168	204
Ohio and lower eastern Mississippi river drainages	65, 75	83	98	128	169	205
Great Lakes and St. Lawrence River drainages	65	83	97	129	170	206
Hudson Bay and upper eastern and western Mississippi River drainages	65, 66, 75	83, 84, 85	98, 99, 100	128, 130	171	207
Missouri River drainage	66, 75	84	99	130, 131	172	208
Meramec, Arkansas, Red, and lower western Mississippi river drainages	66, 75	84	99	131	173	209
Western Gulf of Mexico and Rio Grande drainages	66, 75	84	99	132	174	210
Colorado River drainage above Yuma	66, 75	85	100	133	175	211
The Great Basin drainage	66, 75	85	100	133	176	212
The Great Basin and Pacific Ocean drainages in California, and Colorado River drainage below Yuma	66, 75	85	100	134	177	213
North Pacific Coast drainage	66, 75	85	100	135	178	214

[a] Reports containing data for years prior to 1901 are noted in the series list at the end of this paper.

DEFINITIONS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, *gallons per minute*, miner's inches, and run-off in second-feet per

square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbrevation for cubic foot per second and is the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot: One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.
6. Tables showing discharge and horsepower and the number of days during the year when the same are available.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station, and they also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

SUPPLY OF THE OHIO AND LOWER EASTERN SSIPPI RIVER DRAINAGES, 1906.[a]

ALL, N. C. GROVER, and A. H. HORTON,
District Hydrographers.[b]

INTRODUCTION.

SCOPE OF WORK.

of the United States is of more importance to the the people than is any other natural resource. In limit of agricultural development is determined by er available for irrigation, while in all parts of the se in the population of cities and towns makes al water supplies for domestic and industrial hich both the quantity and the quality of the water ed must be considered. The location of manufac- depend largely on the water-power facilities and f the water. The notable advances made in the on of power have led to the utilization of water ration of manufacturing establishments, railroads, ting plants, many of which are at some distance which the power is developed.

establishment and maintenance of enterprises or pend on the use of water demands a thorough flow of the streams and an understanding of the g that flow. This knowledge should be based on the total flow and the distribution of the flow ar, in order that normal fluctuations may be pro- flow of a stream is variable from year to year, flow can be made only from a study of observa- ral years. The rapid increase in the development

formation similar to that published in previous years under the title eam Measurements."

his paper have been collected as follows: Tennessee River drainage and ver drainage by M. R. Hall, district hydrographer, assisted by W. E. Hall, y; Ohio River drainage from the north by A. H. Horton, district hydrog- ennan and E. F. Kriegsman; Ohio River drainage from the south by N. C. ier.

red for publication under the direction of John C. Hoyt, by R. H. Bolster, nshaw, J. E. Stewart, and H. D. Padgett.

1 per cent. Therefore, most of the values in the tables are giv only three significant figures. In making the various computat Thatcher's slide rule, Crelle's tables, and computation machines been generally used.

In order to give engineers an idea of the relative value of the va data, notes in regard to accuracy are given as far as possible. accuracy depends on the general local conditions at the gaging tions and the amount of data collected. Every effort possible is to so locate the stations that the data collected will give a high d of accuracy. This is not always possible, but it is considered bett publish rough values with explanatory notes rather than no da

In the accuracy notes the following terms have been used, indic the probable accuracy, in per cent, of the mean monthly flow. these values are mean values, the error in the value for the flow o individual day may be much larger.

Excellent indicates that the mean monthly flow is probably rate to within 5 per cent; good, to within 10 per cent; fair, to w 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydr computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).
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1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot-for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
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100 California miner's inches equal 18.7 United States gallons per second.
100 California miner's inches equal 96.0 Colorado miner's inches.
100 California miner's inches for one day equal 4.96 acre-feet.
100 Colorado miner's inches equal 2.60 second-feet.
100 Colorado miner's inches equal 19.5 United States gallons per second.
100 Colorado miner's inches equal 104 California miner's inches.
100 Colorado miner's inches for one day equal 5.17 acre-feet.
100 United States gallons per minute equal 0.223 second-foot.

100 United States gallons per minute for one day equal 0.442 acre-foot.
1,000,000 United States gallons per day equal 1.55 second-feet.
1,000,000 United States gallons equal 3.07 acre-feet.
1,000,000 cubic feet equal 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equal about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel, realizing 80 per cent of theoretical power.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geological Survey) and No. 95 (Accuracy of Stream Measurements). In order that persons using this report may readily become acquainted with the general methods employed, the following brief descriptions are given:

Streams may be divided, with respect to their physical conditions, into three classes: (1) Those with permanent beds; (2) those with beds which change only during extreme low or high water; (3) those with constantly shifting beds. In determining the daily flow special methods are necessary for each class. The data upon which the determinations are based and the methods of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir; (3) by measurements of the velocity of the current and of the area of the cross section. The method chosen for any case depends upon the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v=c\sqrt{R\,s}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The results obtained by the slope method are in general only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in estimating the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir method.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable measurements of flow. The conditions necessary to insure good results may be divided into two classes: (1) Those relating to the physical characteristics of the dam itself and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q=c\,b\,h^{\frac{3}{2}}$, or some similar standard weir formula, are known (see Water-Supply Papers Nos. 180 and 200[a]); (*f*) either no flash boards or exceptional care in reducing leakage through them and in recording their condition.

Preferably, there should be no diversion of water through or around the dam. Generally, however, a dam is built for purposes of power or navigation, and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such determinations of flow the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured either by a weir, a current meter, or a simple system of water wheels which are of standard make, or which have been rated as meters under working conditions and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the determinations of flow will not involve, for a critical stage of considerable duration, the use of a head on a broad-

[a] *Water-Supply Paper No. 200* replaces No. 150, the edition of which has been exhausted.

sted dam of less than 6 inches. Moreover, when all other condi-ns are good, the cooperation of the owners or operators of the nt is still essential if reliable results are to be obtained.

A gaging station at a weir or dam has the general advantage of ntinuity of record through the period of ice and floods, and the advantages of uncertainty of coefficient to be used in the weir mula and of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water wing past a certain section of a stream at a given time is termed discharge measurement. This quantity is the product of two ctors—the mean velocity and the area of the cross section. The ean velocity is a function of surface slope, wetted perimeter, rough-ss of bed, and the channel conditions at, above, and below the ging section. The area depends upon the contour of the bed and e fluctuations of the water surface. The two principal ways of easuring the velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging sta-ons for determining discharge by velocity measurements in order at the data may have the required degree of accuracy. Their sential requirements are practically the same, whether the velocity determined by meters or floats. They are located, as far as possible, here the channel is straight both above and below the gaging sec-on; where there are no cross currents, backwater, or boils; where e bed of the stream is reasonably free from large projections of a ermanent character, and where the banks are high and subject to verflow only at flood stages. The station must be so far removed om the effects of tributary streams and of dams or other artificial bstructions that the gage height shall be an index of the discharge.

Certain permanent or semipermanent structures, usually referred o as "equipment," are generally pertinent to a gaging station. hese are a gage for determining the fluctuations of the water surface, ench marks to which the datum of the gage is referred, permanent narks on a bridge or a tagged line indicating the points of measure-nent, and, where the current is swift, some appliance (generally a econdary cable) to hold the meter in position in the water. As a ule, the stations are located at bridges if the channel conditions are atisfactory, as from them the observations can more readily be made nd the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube r rod floats. A corked bottle with a flag in the top and weighted t the bottom makes one of the most satisfactory surface floats, as is affected but little by wind. In case of flood measurements, ood results can be obtained by observing the velocity of floating akes of ice or débris. In case of all surface-float measurements efficients *must be used to reduce* the observed velocity to the mean

1 per cent. Therefore, most of the values in the tables are given to only three significant figures. In making the various computations, Thatcher's slide rule, Crelle's tables, and computation machines have been generally used.

In order to give engineers an idea of the relative value of the various data, notes in regard to accuracy are given as far as possible. This accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data.

In the accuracy notes the following terms have been used, indicating the probable accuracy, in per cent, of the mean monthly flow. As these values are mean values, the error in the value for the flow of any individual day may be much larger.

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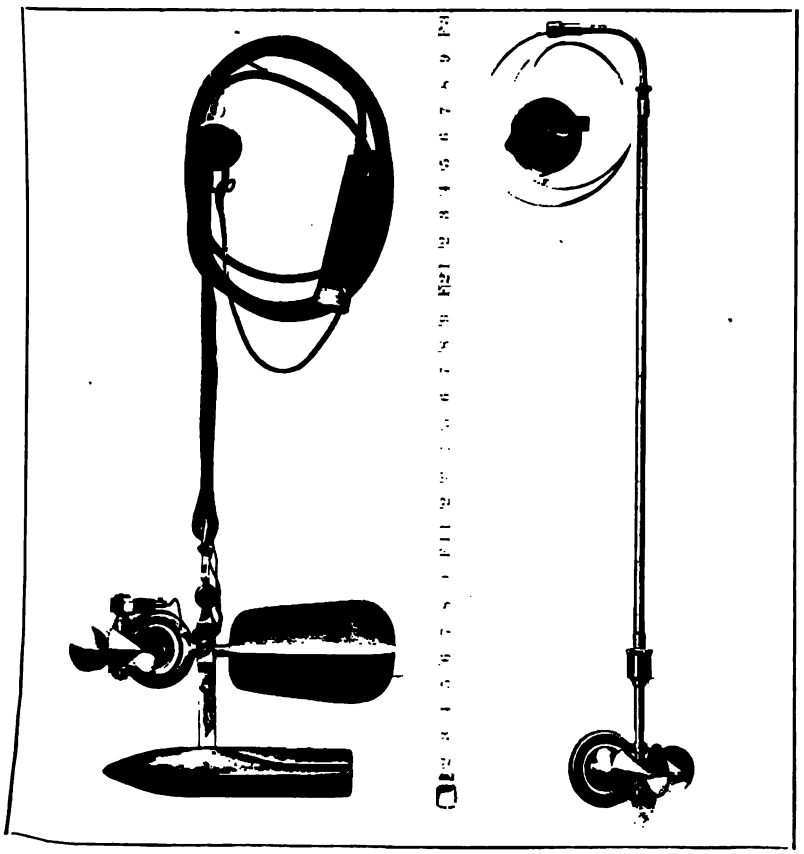
A. CURRENT-METER RATING STATION AT LOS ANGELES CAL



B. PRICE CURRENT METERS.

velocity. The subsurface and tube or rod floats are intended to g directly the mean velocity in the vertical. Tubes give good results when the channel conditions are good, as in canals.

In measuring velocity by a float, observation is made of the t taken by the float to pass over the "run," a selected stretch of r from 50 to 200 feet long. In each discharge measurement a l number of velocity determinations are made at different po across the stream, and from these observations the mean velo for the whole section is determined. This may be done by plot the mean positions of the floats as indicated by the distances f the bank as ordinates and the corresponding times as abscissas curve through these points shows the mean time of run at any p across the stream, and the mean time for the whole stream is obta by dividing the area bounded by this curve and its axis by the w The length of the run divided by the mean time gives the r velocity.

The area used in float measurements is the mean of the are the two ends of the run and at several intermediate sections.

The essential parts of the current meters in use are a wheel of a type, so constructed that the impact of flowing water causes revolve, and a device for recording or indicating the number of r lutions. The relation between the velocity of the moving w and the revolutions of the wheel is determined for each meter. rating is done by drawing the meter through still water for a g distance at different speeds, and noting the number of revolut for each run. From these data a rating table is prepared w gives the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They r however, be classed in two general types—those in which the w is made up of a series of cups, as the Price, and those having a sc propeller wheel, as the Haskell. Each meter has been devel for use under some special condition. In the case of the small F meter, shown in Pl. II, *B*, which has been largely developed and ex sively used by the United States Geological Survey, an attempt been made to get an instrument which could be used under practic all conditions.

Current-meter measurements may be made from a bridge, ca boat, or by wading, and gaging stations may be classified in acc ance with such use. Fig. 1 shows a typical cable station.

In making the measurement an arbitrary number of po laid off on a line perpendicular to the thread of the str points at which the velocity and depth are observed a measuring points and are usually fixed at regular inte from 2 to 20 feet, depending on the size and conditi Perpendiculars dropped from the measuring point

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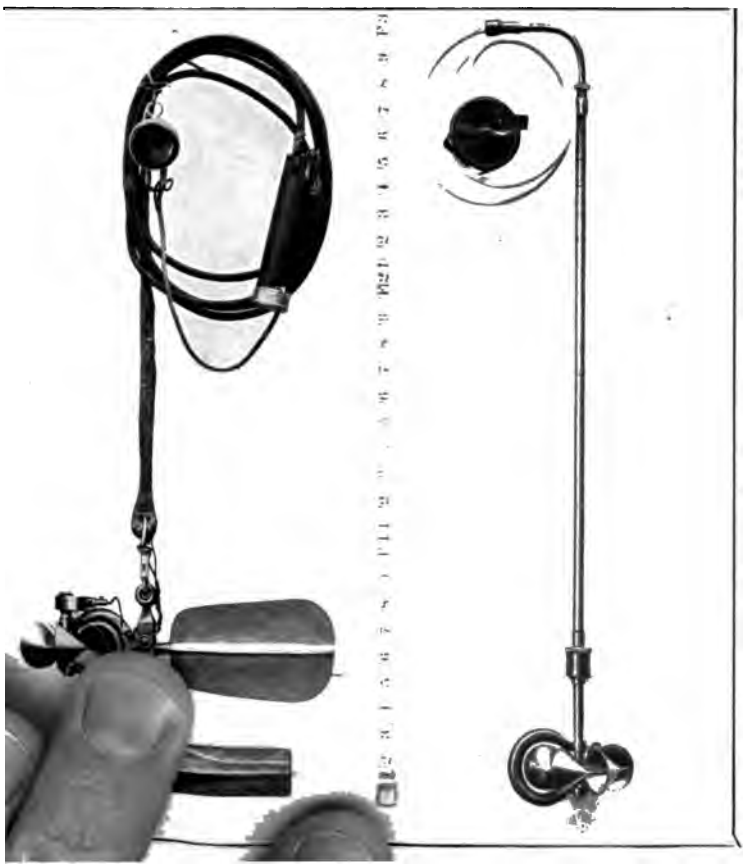

ETERS.

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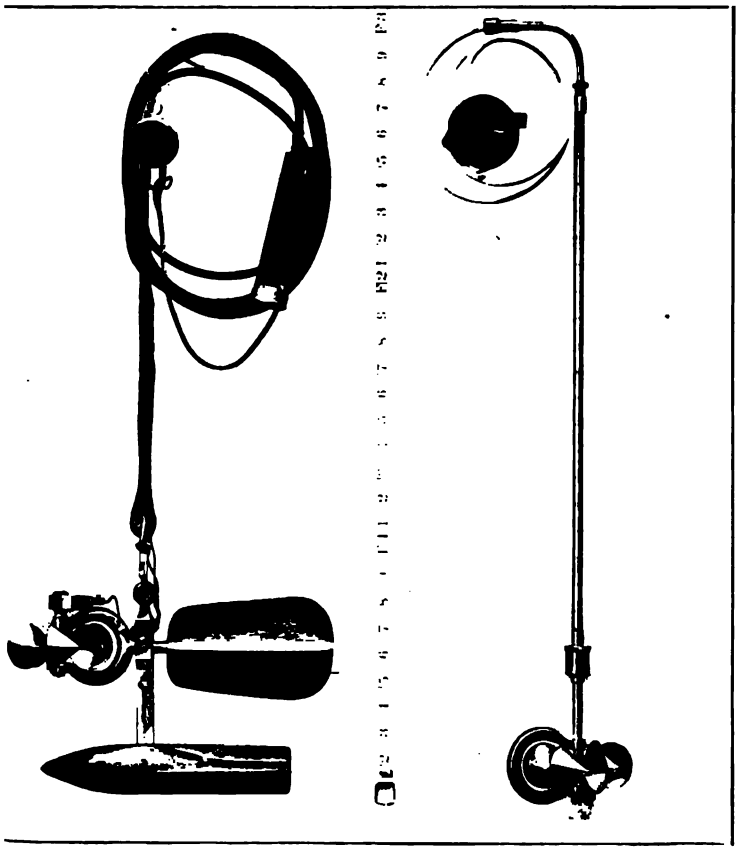
In making the measurement an arbitrary number of points laid off on a line perpendicular to the thread of the stream. T points at which the velocity and depth are observed are known measuring points and are usually fixed at regular intervals, vary from 2 to 20 feet, depending on the size and condition of the strea *Perpendiculars* dropped from the measuring points divide the gag

A. CURRENT-METER RATING STATION AT LOS ANGELES CAL.



B. PRICE CURRENT METERS.

ction into strips. For each strip or pair of strips the mean velocity, ea, and discharge are determined independently, so that conditions isting in one part of the stream may not be extended to parts where ey do not apply.

Three classes of methods of measuring velocity with current meters e in general use—multiple-point, single-point, and integration.

The three principal multiple-point methods in general use are the rtical velocity-curve; 0.2 and 0.8 depth; and top, bottom, and mid pth.

In the vertical velocity-curve method a series of velocity determi-ions are made in each vertical at regular intervals, usually from to 1 foot apart. By plotting these velocities as abscissas and ir depths as ordinates, and drawing a smooth curve among the re-ing points, the vertical velocity-curve is developed. This curve ws graphically the magnitude and changes in velocity from the face to the bottom of the stream. The mean velocity in the ver-

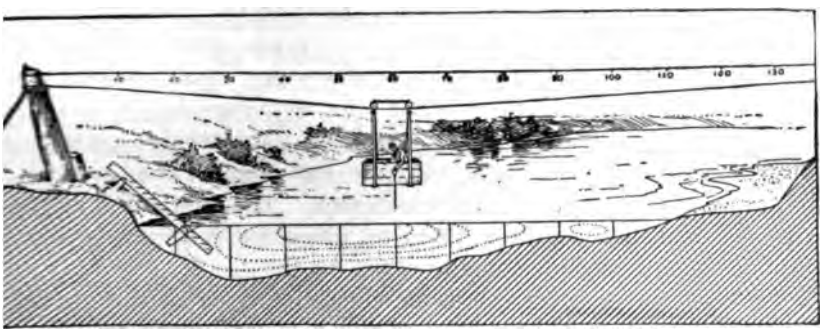


FIG. 1.—Cable station, showing section of river, car, gage, etc.

al is then obtained by dividing the area bounded by this velocity ve and its axis by the depth. On account of the length of time uired to make a complete measurement by this method, its use is ited to the determination of coefficients for purposes of compar-n and to measurements under ice.

In the second multiple-point method the meter is held successively 0.2 and 0.8 of the depth, and the mean of the velocities at these o points is taken as the mean velocity for that vertical. On the sumption that the vertical velocity-curve is a common parabola th horizontal axis, the mean of the velocities at 0.22 and 0.79 of e depth will give (closely) the mean velocity in the vertical. Actual servations under a wide range of conditions show that this second ultiple-point method gives the mean velocity very closely for open-ater conditions, and, moreover, the indications are that it holds arly as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid depth,

at 0.5 foot below the surface, and at 0.5 foot above the bottom, and the mean velocity is determined by dividing by 6 the sum of the top velocity, four times the mid-depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity, or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity-curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in the majority of measurements. A large number of vertical velocity-curve measurements, taken on many streams and under varying conditions, show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is especially adapted for flood measurements or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface, and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river, which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable, or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

. computing the discharge measurements from the observed cities and depths at various points of measurement the measur- section is divided into elementary strips, as shown in fig. 1, and mean velocity, area, and discharge are determined separately either a single or a double strip. The total discharge and the , are the sums of those for the various strips, and the mean veloc- is obtained by dividing the total discharge by the total area.

he determination of the flow of an ice-covered stream is difficult, ng to diversity and instability of conditions during the winter iod and also to the lack of definite information in regard to the s of flow of water under ice. The method now employed is to ke frequent discharge measurements during the frozen periods by 0.2 and 0.8, and vertical velocity-curve methods, and to keep an urate record of the conditions, such as the gage height to the sur- e of the water as it rises in a hole cut in the ice, the thickness and racter of the ice, etc.

From these data an approximate estimate of the daily flow can be de by constructing a rating curve (really a series of curves) simi- to that used for open channels, but considering, in addition to e heights and discharge, the varying thickness of ice.

For information in regard to flow under ice cover see Water-Supply per No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of determining run-off, depending whether or not the bed of the stream is permanent.

For stations on streams with permanent beds the first step in com- ting the run-off is the construction of the rating table, which shows discharge corresponding to any stage of the stream. This rating le is applied to the record of stage to determine the amount of ter flowing. The construction of the rating table depends on the thod used in measuring flow.

For a station at a weir or dam the basis for the rating table is some ndard weir formula. The coefficients to be used in its applica- n depend on the type of dam and other conditions near its crest. ter inserting in the weir formula the measured length of crest and sumed coefficient, the discharge is computed for various heads and e rating table constructed.

The data necessary for the construction of a rating table for a locity-area station are the results of the discharge measurements, ich include the record of stage of the river at the time of measure- nt, the area of the cross section, the mean velocity of the current, d the quantity of water flowing. A thorough knowledge of the iditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends on the following la of flow for open, permanent channels: (1) The discharge will rema constant so long as the conditions at or near the gaging station rema constant; (2) the discharge will be the same whenever the stream at a given stage if the change of slope due to the rise and fall of t stream be neglected; (3) the discharge is a function of and increa gradually with the stage.

The plotting of the results of the various discharge measurement using gage heights as ordinates, and discharge, mean velocity, a area as abscissas, will define curves which show the discharge, me velocity, and area corresponding to any gage height. For the dev opment of these curves there should be, therefore, a sufficient nu ber of discharge measurements to cover the range of the stage of t stream. Fig. 2 shows a typical rating curve, with its correspond mean-velocity and area curves.

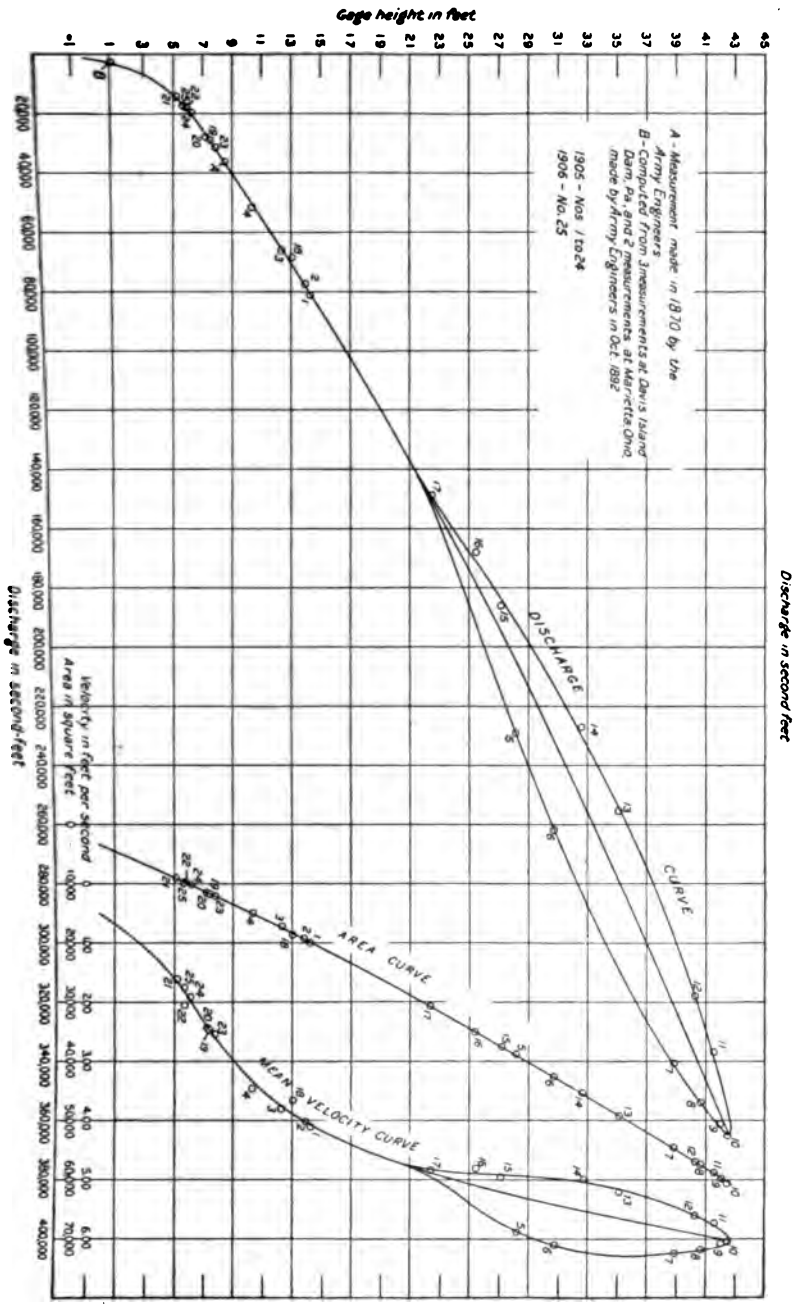
As the discharge is the product of two factors, the area and t mean velocity, any change in either factor will produce a correspo ing change in the discharge. Their curves are therefore construct in order to study each independently of the other.

The area curve can be definitely determined from accurate sou ings extending to the limits of high water. It is always conca toward the horizontal axis or on a stra ht line, unless the banks the stream are overhanging.

The form of the mean-velocity curve depends chiefly upon the su face slope, the roughness of the bed, and the cross section of t stream. Of these the slope is the principal factor. In accordan with the relative change of these factors the curve may be either straight line, convex or concave toward either axis, or a combin tion of the three. From a careful study of the conditions at a gaging station the form which the vertical velocity-curve will ta can be predicted, and it may be extended with reasonable certaint to stages beyond the limits of actual measurements. Its princip use is in connection with the area curve in locating errors in dischar measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements discharge, which are studied and weighted in accordance with t local conditions existing at the time of each measurement. T curve may, however, best be located between and beyond the mea urements by means of curves of area and mean velocity. This curv under normal conditions is concave toward the horizontal axis an is generally parabolic in form.

In the preparation of the rating table the discharge for each tent or half tenth on the gage is taken from the curve. The differenc between successive discharges are then taken and adjusted accord ing to the law that they shall either be constant or increasing.



Discharge, area and mean-velocity curves for Ohio River at Wheeling, W. Va.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the determinations of flow are to be other than rough approximations. For stations with beds which shift slowly, or are materially changed only during floods, rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days and the discharges for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report United States Geological Survey, Part IV, page 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in determining the flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Assistance has been rendered or records furnished by the following, to whom special acknowledgment is due: Officers and employees of the United States Weather Bureau; officers and employees of the Corps of Engineers, United States Army; and the Illinois Central Railroad.

OHIO RIVER DRAINAGES.

OHIO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Ohio River, which is formed by the junction of Allegheny and onongahela rivers at Pittsburg, flows in a southwesterly direction, rming the boundaries between and draining the States of Ohio, diana, and Illinois on the north and West Virginia and Kentucky the south. Its tributaries also drain portions of New York, Pennlvania, Maryland, Virginia, North Carolina, Georgia, Alabama, and ississippi.

The length of the stream, as surveyed by the United States Army gineers, from Pittsburg to Cairo is 967 miles.[a]

The river presents an interesting series of shoals and riffles, sepated by pools in which the water is deeper and the fall very low. he summary of the profile made by the army engineers shows 187 ools with over 7 feet depth at low water. These occupy 632.5 miles nd have an average length of 3.47 miles. Of these, 127 pools above ouisville, Ky., average 2.8 miles, with a total length of 363 miles; nd 60 pools below Louisville, with a total length of 266 miles, have n average length of 4.4 miles.

On the borders of Ohio the riffles (103 in number) cover a combined length of 137 miles and have a total fall of 170 feet. The pools, vith a combined length of 309 miles, have a fall of 64 feet, or but 2.5 nches per mile. The greatest fall noted for a single mile on the order of this State is at Letart Falls, Meigs County, where a descent of 3.2 feet is made. There are 11 riffles, with a descent exceeding 2 feet per mile. The least fall reported is in a pool 8 to 15 miles below Cincinnati. This pool, with a length of 7 miles, has a fall of but 3.5 nches. Another pool with about as low a fall is found 23 to 30 miles bove Cincinnati. These are the most conspicuous pools in this ection of the Ohio.

On the borders of Indiana there are 55 riffles aside from the Louisille rapids. These show a total fall of 80.28 feet in a combined distance of 134.5 miles. At the Louisville rapids there is a fall of 23.09 eet in 2.25 miles. There is left but 18.13 feet for the fall of the stream n about 215 miles embraced in the pools, or only 1 inch per mile.

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[a] Ex. Doc. No. 72, House of Representatives, Forty-first Congress, third session, January, 1871, p. 139-153.

In general the rock floor of the valley is 30 to 50 feet below the level of the stream at low water. It rarely reaches a lower level than 75 feet below the stream. Its level is 65 or 75 feet below the stream between Evansville, Ind., and Shawneetown, Ill. It is thought that no place occurs in the whole length of the valley where a rock barrier crosses its entire width at a level as high as the bed of the present stream. In several places rock shelves extend out part way across the river bed, leaving a channel deep enough for the passage of boats along the opposite bank. At Letart Falls the rock is stated to extend across the entire breadth of the stream, but it dips toward the east bank sufficiently to allow the passage of boats when the rock of the western part of the stream bed is above the water surface. Well data indicate that this descent continues eastward beneath the bottom lands to a level as low as in the neighboring parts of the channel. Near Ravenswood, W. Va., rocky reefs are exposed at low water fully halfway across the stream bed, but wells on the bottom lands near the village show the rock floor to be at least 25 feet below the stream at low water. At Louisville it is found by wells and bridge soundings that a channel 25 feet or more lower than the present surface at the head of the rapids leads southwestward from near the south end of the Jeffersonville bridge a short distance and then turns westward, passing through the midst of the city.[a] Thus at the side of each of the three most conspicuous rock reefs touched by the stream a buried channel apparently occurs.

Notwithstanding the great number of riffles and shoals, the Ohio is generally navigable throughout the entire season for small boats drawing less than 3 feet of water. It is navigable for vessels drawing 6 feet of water during a few months of the early part of the season, but there is usually little traffic with such boats after the month of July. The canal at Louisville affords opportunity for passing around the rapids during low water. During high-water stages the boats are able to pass over the rapids.

The valley of Ohio River along the southern boundary of Ohio and Indiana is very narrow except for a few miles near Louisville, where it has expanded itself in the Devonian shales, and for a similar widening in the southwestern portion of Indiana in the Coal Measures. Its narrowness has been a subject of remark from the early days of settlement. There are very few places between Pittsburg and Louisville where its width exceeds 2 miles, and usually it is scarcely more than 1 mile wide. In the vicinity of Louisville, where it crosses the low tract formed in the Devonian shales, it has a width of perhaps 4 miles, but on entering the Knobstone escarpment below the mouth of Salt River it narrows abruptly to a width of about 1 mile and remains narrow

[a] Data on this subject were furnished by Maj. William J. Davis, of the Louisville school board, and by Messrs. John Ryan and John C. Oestrich, of the Louisville Pump Works.

or nearly 100 miles in its passage through the hard beds of Lower Carboniferous age. It then enters the Coal Measures and soon attains a width of 6 or 8 miles, which it maintains for much of its course to Cairo. The only exception is found at the point where it passes the elevated ridge below Shawneetown, where its width is reduced to about 2½ miles. The depth of the valley ranges from about 600 feet down to scarcely 100 feet, being greatest on the border of the "panhandle" of West Virginia and least in the lower portion of its course. Its depth seldom falls below 300 feet in the portion above Louisville and probably averages 450 feet. The narrow portion below Louisville is about 300 feet deep. The broad portions at Louisville and in the lower parts of its course are but 100 to 150 feet in depth. The work done by the river in excavating a narrow valley through the elevated districts is apparently commensurate with that accomplished in eroding a wide valley in the low districts.

The entire work of the stream, however, is less than should have been accomplished by a drainage line of this size in the time since the beginning of development of drainage lines. It is far less in proportion to its size than the work accomplished by the small tributaries which enter it from southern Indiana. The explanation of this meager amount of work is found in the enlargement of the river in recent times. Investigations now in progress indicate that several independent drainage lines which formerly led northward from the Appalachian Mountains across southwestern New York, northwestern Pennsylvania, and Ohio into the Lake Erie basin have been united to form the present Ohio. The full extent of these changes is not yet determined, nor are all of the outlets for the old river systems satisfactorily traced; but enough is known to justify the statement that the small size of the valley of the Ohio is attributable to the recent union of the several independent drainage systems.

OHIO RIVER AT WHEELING, W. VA.

The United States Weather Bureau has made observations of the stage of Ohio River at Wheeling, W. Va., since 1882. In 1905 measurements of the flow were begun by the United States Geological Survey. Gage heights are furnished by the United States Weather Bureau. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 20.

The following discharge measurement was made May 22, 1906:

Width, 1,220 feet; area, 9,880 square feet; gage height, 5.70 feet; discharge, 17 second-feet.

Daily gage height, in feet, of Ohio River, at Wheeling, W. Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	14.9	8.6	7.2	26.6	8.9	5.9	4.9	4.3	4.7	2.9	8.0	
2	13.0	8.3	6.8	26.3	7.6	5.7	4.4	4.0	4.0	3.9	8.2	
3	11.3	7.8	6.1	21.8	7.5	5.3	4.0	3.9	3.9	4.1	8.0	
4	12.0	6.9	6.5	21.3	7.8	5.3	3.4	3.3	3.9	4.5	7.5	
5	15.6	6.3	8.0	14.7	8.1	7.2	3.9	2.8	3.9	5.0	6.9	
6	19.3	5.6	10.9	13.0	9.0	7.0	3.6	3.4	4.0	5.1	6.4	
7	16.1	5.4	10.9	13.9	9.6	6.4	3.1	3.1	4.1	5.0	5.9	
8	13.3	5.1	9.9	15.7	9.0	6.6	3.1	3.5	4.1	6.0	5.7	
9	11.0	4.8	8.9	14.1	8.6	16.4	3.4	6.3	3.6	7.0	5.5	
10	9.4	4.2	8.6	13.5	7.9	12.0	3.5	10.5	3.3	8.3	5.1	
11	8.2	4.3	8.3	16.3	7.5	9.0	2.9	13.7	2.9	8.8	4.9	
12	7.0	4.5	8.0	19.3	7.3	7.7	2.5	15.3	2.8	8.3	4.5	
13	7.0	4.8	7.8	18.0	7.2	6.6	2.4	13.0	2.7	7.9	4.8	
14	7.1	4.7	7.7	15.9	6.9	6.1	2.3	9.9	2.9	7.9	4.6	
15	8.2	4.7	7.8	14.0	6.6	5.4	2.1	7.9	3.0	7.8	4.8	
16	10.0	4.8	7.8	13.7	6.4	4.9	2.5	6.9	3.0	7.2	5.3	
17	12.3	4.8	13.3	17.0	6.1	4.6	3.2	6.3	3.1	7.0	5.9	
18	11.9	4.8	13.7	16.4	6.3	4.5	5.2	5.6	3.2	6.9	5.9	
19	11.9	4.9	10.8	13.6	6.2	4.5	6.6	5.6	3.0	6.3	7.1	
20	11.9	4.9	9.8	11.8	5.9	4.6	5.9	5.6	2.9	6.2	9.3	
21	11.9	5.1	12.3	10.4	5.9	4.1	4.6	9.1	3.2	7.2	12.9	
22	11.1	5.3	14.3	9.3	5.8	4.4	3.9	12.6	4.5	7.9	18.0	
23	11.4	5.6	11.9	8.9	5.2	5.8	4.2	10.0	4.0	9.0	16.6	
24	16.2	6.9	9.9	8.5	4.9	7.6	5.8	9.6	3.7	8.2	13.9	
25	24.3	8.0	8.4	8.3	4.4	7.8	4.2	8.1	3.2	7.3	11.6	
26	21.3	8.6	7.9	8.3	4.7	6.5	4.5	7.6	3.4	6.9	9.9	
27	16.9	8.3	10.0	8.3	4.3	5.6	4.2	6.9	3.1	6.3	8.6	
28	13.5	8.1	17.6	16.3	4.5	5.1	3.9	5.9	3.0	6.9	7.9	
29	12.3	.....	24.4	15.0	4.4	4.8	3.9	6.0	3.0	7.2	7.0	
30	10.3	.....	25.6	10.9	5.1	5.0	5.5	5.4	2.9	7.1	6.9	
31	9.9	.....	23.9	.....	5.9	.....	4.8	5.0	.....	7.6	.....	

Rating table for Ohio River at Wheeling, W. Va., from 1882 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.10	4,980	4.10	10,560	6.20	19,990	11.00	55,100
2.20	5,200	4.20	10,900	6.40	21,230	12.00	62,800
2.30	5,430	4.30	11,250	6.60	22,520	13.00	70,600
2.40	5,660	4.40	11,600	6.80	23,850	14.00	78,500
2.50	5,900	4.50	11,960	7.00	25,220	15.00	86,500
2.60	6,150	4.60	12,330	7.20	26,630	16.00	94,600
2.70	6,400	4.70	12,710	7.40	28,080	17.00	102,830
2.80	6,660	4.80	13,100	7.60	29,540	18.00	111,200
2.90	6,930	4.90	13,500	7.80	31,020	19.00	119,700
3.00	7,200	5.00	13,900	8.00	32,500	20.00	128,330
3.10	7,480	5.10	14,310	8.20	34,000	21.00	137,100
3.20	7,760	5.20	14,740	8.40	35,500	22.00	146,040
3.30	8,050	5.30	15,190	8.60	37,000	23.00	155,140
3.40	8,340	5.40	15,660	8.80	38,500	24.00	164,440
3.50	8,640	5.50	16,150	9.00	40,000	25.00	173,900
3.60	8,940	5.60	16,650	9.20	41,500	26.00	183,530
3.70	9,250	5.70	17,170	9.40	43,000	27.00	193,300
3.80	9,570	5.80	17,700	9.60	44,500		
3.90	9,890	5.90	18,250	9.80	46,000		
4.00	10,220	6.00	18,810	10.00	47,500		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 24 discha measurements made during 1905, one in 1906, one prior to 1893, and one low-water measurement c puted from five measurements made by the United States Army engineers abov and below Whee in 1892.

It is well defined above gage height 5 feet. Below 5 feet it is based on one measurement at 1.1 f *computed from* the army engineers' measurements, and the extension of the area and velocity cur *and can be considered* accurate within a few per cent.

Monthly discharge of Ohio River at Wheeling, W. Va., for 1906.

[Drainage area, 23,800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	167,000	25,200	68,300	2.87	3.31
February	37,000	10,900	19,800	.832	.87
March	180,000	19,400	39,000	1.66	1.91
April	189,000	34,800	85,500	3.59	4.00
May	44,500	11,200	23,900	1.00	1.15
June	97,900	10,600	23,100	.971	1.08
July	22,500	4,980	10,500	.441	.51
August	88,900	6,660	29,200	1.23	1.42
September	12,700	6,400	8,530	.358	.40
October	40,000	6,930	24,400	1.03	1.19
November	111,000	12,000	33,500	1.41	1.57
December	154,000	18,800	66,100	2.78	3.20
The year	189,000	4,980	36,000	1.51	20.61

NOTE.—Values for 1906 are excellent.

ALLEGHENY RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Allegheny River, which, with the Monongahela, forms the Ohio at Pittsburg, rises in northern Pennsylvania, flows north into the State of New York, then south through western Pennsylvania. The headwaters have an elevation of about 2,500 feet and join those of Genesee River on the north and of the Susquehanna on the east. The total length from the source to the mouth at Pittsburg is about 300 miles, 47 of which are in the State of New York. The principal facts concerning this river have been given in a report by George Lehman, assistant engineer, contained in House Document No. 72, Fifty-fifth Congress, third session. Although this river drains a large area, much of which is of an elevated and even mountainous character, yet it is of comparatively small value for water power. The total fall in 255 miles between Olean, N. Y., and the mouth is only 725 feet, or an average of less than 3 feet per mile. This descent is accomplished without abrupt pitches, and even with few rapids having a fall of much consequence. The drainage basin of Allegheny River above Redhouse is comparatively rugged and precipitous. It is mostly covered with brush and light forest. A considerable amount of snow accumulates in the winter and feeds the stream until late in spring. The basin is underlain by shales of the Chemung formation, and the depth of soil is usually small, excepting in stream valleys. There are no lakes and no artificial storage tributary to the stream. The Cuba reservoir, which feeds the Erie Canal through Genesee River, lies on the divide between the Allegheny and Genesee drainage basins. A part of the overflow from this reservoir passes into the Allegheny; the rest passes into Genesee River. During about half

of the year the river is navigable for small steamers to Franklin, 12 miles above Pittsburg.

The drainage areas of the river and its chief tributaries are give in the following table:

Drainage areas, in square miles, of Allegheny River and tributaries.

Stream.	Locality.	Drainag area.
Allegheny River	Mouth	11,10
Do	Kittanning	8,69
Do	Above mouth of French Creek	5,99
Do	Franklin	5,67
Do	Warren	3,05
Do	Salamanca	1,59
Do	Olean, below Olean Creek	1,10
Do	Port Allegheny	22
Conewango Creek	Mouth	93
Tionesta Creek	do	45
French Creek	do	1,18
Clarion River	do	1,18
Redbank Creek	do	52
Mahoning Creek	do	39
Kiskiminitas River	do	1,85
Do	Salina	1,77
Blacklick Creek	Blacklick	40

ALLEGHENY RIVER AT REDHOUSE, N. Y.

This station was established September 4, 1903. It is located a the Redhouse Bridge, near the stations of the Erie and Pennsylvani railroads and about 5 miles below Salamanca, N. Y., about 13 mil above the point where the river leaves New York State. The co ditions at this station and the bench marks are described in Wat Supply Paper No. 169, page 25, where are given also references publications that contain data for previous years.

following discharge measurement was made April 16, 1906:

h, 370 feet; area, 2,250 square feet; gage height, 6.59 feet; discharge, 7,820 feet.

Daily gage height, in feet, of Allegheny River at Redhouse, N. Y., for 1906.

y.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	6.2	4.55	3.6	7.15	4.25	4.75	3.0	3.0	3.0	4.1	5.25	4.2
.....	5.8	4.35	3.6	6.8	4.3	4.45	3.0	2.95	3.0	3.75	4.95	4.3
.....	5.25	4.15	3.65	6.25	5.5	4.25	3.1	2.9	3.05	3.5	4.9	4.2
.....	5.7	4.2	4.75	6.1	5.25	4.05	3.1	2.9	3.4	3.5	4.9	4.0
.....	6.05	4.0	4.75	6.65	5.35	3.85	3.05	3.55	3.45	3.5	4.8	4.05
.....	5.5	3.9	4.25	6.75	5.3	4.15	3.1	3.3	3.3	4.0	4.7	5.6
.....	5.2	3.85	4.2	6.7	4.85	4.1	3.1	3.3	3.05	6.0	4.45	8.6
.....	4.8	3.8	4.1	6.25	4.75	3.95	3.0	3.6	3.0	5.85	4.25	7.25
.....	4.55	3.85	4.0	5.95	4.6	3.8	2.9	3.6	2.9	5.5	4.15	6.45
.....	4.3	3.8	3.85	6.65	4.8	3.7	2.9	3.7	2.8	5.25	4.0	6.15
.....	4.35	3.75	3.8	7.1	4.8	3.65	2.9	3.8	2.8	5.1	4.1	6.9
.....	4.35	3.8	3.8	6.4	4.7	3.55	2.9	4.0	2.7	5.0	4.2	6.4
.....	4.3	3.65	3.7	6.6	4.55	3.4	2.85	3.75	2.8	5.0	4.35	6.55
.....	4.2	3.7	3.6	6.45	4.65	3.3	2.8	3.5	3.0	5.4	4.2	6.65
.....	4.15	3.75	3.6	6.3	4.75	3.3	2.8	3.4	3.0	5.15	4.1	8.8
.....	4.55	3.75	3.6	6.45	4.5	3.3	2.8	3.3	3.0	4.85	4.0	8.8
.....	4.75	3.65	3.5	6.35	5.45	3.3	2.8	3.15	2.9	4.55	4.05	6.2
.....	4.7	3.5	3.5	6.0	5.35	3.3	2.8	3.0	2.8	4.3	4.75	6.65
.....	4.6	3.5	3.4	5.55	4.9	3.6	2.8	3.1	2.8	4.2	5.75	6.65
.....	4.6	3.5	3.2	5.35	4.6	3.45	2.85	3.1	2.8	5.0	5.5	6.45
.....	6.5	3.6	3.2	5.5	4.25	3.4	2.9	3.9	3.0	5.1	6.25	6.45
.....	7.7	3.9	3.2	5.1	4.05	3.3	2.85	4.05	4.0	4.75	6.55	6.45
.....	8.1	3.8	3.1	4.7	3.95	3.3	2.8	3.8	3.75	4.65	5.8	6.45
.....	8.25	3.8	3.0	5.3	4.0	3.35	2.8	3.6	3.45	4.5	5.35	6.1
.....	7.6	3.7	3.3	5.2	4.85	3.2	2.8	3.55	3.3	4.8	5.0	.....
.....	7.0	3.75	3.4	4.85	4.6	3.2	2.8	3.35	3.15	5.05	4.75	.....
.....	6.5	3.6	5.25	4.8	4.7	3.2	2.7	3.2	3.1	4.7	4.5	.....
.....	5.85	3.5	8.4	4.7	5.3	3.1	2.7	3.2	3.0	4.5	4.6	.....
.....	5.3	.....	7.3	4.5	5.35	3.1	2.8	3.2	3.0	4.95	4.55	.....
.....	4.95	.....	6.9	4.4	5.05	3.0	2.8	3.1	3.55	4.5	4.4	.....
.....	4.85	.....	7.75	.....	5.2	.....	3.0	3.1	.....	5.2	.....	.....

-Discharge affected slightly by ice conditions during February and March; the channel was ly closed.

Rating table for Allegheny River at Redhouse, N. Y., for 1903 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.70	195	4.00	1,471	5.30	3,820	7.20	9,400
2.80	260	4.10	1,605	5.40	4,065	7.40	10,080
2.90	328	4.20	1,745	5.50	4,315	7.60	10,790
3.00	400	4.30	1,891	5.60	4,570	7.80	11,530
3.10	478	4.40	2,043	5.70	4,830	8.00	12,300
3.20	564	4.50	2,200	5.80	5,100	8.20	13,120
3.30	658	4.60	2,365	5.90	5,375	8.40	13,960
3.40	759	4.70	2,540	6.00	5,660	8.60	14,800
3.50	866	4.80	2,725	6.20	6,245	8.80	15,660
3.60	978	4.90	2,920	6.40	6,845	9.00	16,540
3.70	1,095	5.00	3,130	6.60	7,460		
3.80	1,216	5.10	3,350	6.80	8,090		
3.90	1,341	5.20	3,580	7.00	8,740		

-The above table is applicable only for open-channel conditions. It is based on 20 discharge ıents made during 1903–1906. It is very well defined between gage heights 3.1 feet and 10 feet.

Monthly discharge of Allegheny River at Redhouse, N. Y., for 1906.

[Drainage area, 1,640 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	13,300	1,680	4,780	2.91	3.36
February [a]	2,280	866	1,240	.756	.79
March [a]	14,000	400	2,460	1.50	1.73
April	9,240	2,040	5,570	3.40	3.79
May	4,320	1,410	2,800	1.71	1.97
June	2,630	400	1,000	.610	.68
July	478	195	322	.196	.23
August	1,540	328	777	.474	.55
September	1,470	195	505	.308	.34
October	5,660	866	2,740	1.67	1.92
November	7,300	1,470	2,860	1.74	1.94
December [b]	15,700	1,470	5,930	3.62	4.17
The year	15,700	195	2,580	1.57	21.47

[a] No correction on account of ice conditions was made in values for February and March, and they may be a few per cent too high.

[b] Daily discharge, December 25-31, determined, approximately, by comparison of flow at this station with the flow at Kittanning, Pa.

NOTE.—Values for 1906 are excellent, except those for February, March, and July, which are good.

ALLEGHENY RIVER AT KITTANNING, PA.

This station, established August 18, 1904, is located at Market Street Bridge. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 28, where are given also references to publications that contain data for previous years.

The following discharge measurement was made May 23, 1906:

Width, 719 feet; area, 4,030 square feet; gage height, 4.40 feet; discharge, 6,700 ond-feet.

Daily gage height, in feet, of Allegheny River at Kittanning, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	9.7	6.3	4.5	13.2	4.7	4.8	2.5	2.2	2.6	2.5	7.7	5.6
.....	8.8	5.8	4.8	11.8	4.8	4.6	2.3	2.3	3.1	3.8	7.4	5.2
.....	8.9	5.1	5.5	10.0	4.8	4.5	2.3	2.1	3.5	4.1	7.6	5.1
.....	9.1	4.4	5.9	9.4	6.3	.....	2.4	2.1	3.4	4.2	6.2	5.0
.....	10.2	4.5	6.2	8.6	6.7	3.9	2.4	2.0	3.5	3.8	5.8	5.3
.....	9.8	4.4	6.9	9.5	6.7	3.7	2.4	2.0	3.6	3.2	5.6	5.8
.....	8.6	4.3	6.2	10.2	7.1	9.3	2.4	2.1	3.2	3.4	5.4	13.8
.....	7.3	4.2	5.9	9.5	5.6	7.35	2.4	3.7	2.9	6.0	5.1	13.0
.....	6.7	4.1	5.7	8.8	5.7	5.6	2.4	4.9	2.6	7.2	4.8	11.6
.....	5.4	4.0	5.5	11.2	5.6	5.1	2.3	4.1	2.4	6.9	4.6	7.9
.....	6.0	3.9	5.4	13.2	5.4	4.7	2.3	5.5	2.2	6.9	4.5	10.5
.....	5.7	3.9	5.3	12.2	5.4	4.1	2.3	5.2	2.4	7.2	4.5	11.5
.....	6.4	3.9	5.1	10.3	5.4	3.8	2.2	4.8	2.5	6.9	4.6	10.1
.....	5.7	4.0	4.8	9.5	5.3	3.6	2.1	3.9	2.4	6.8	5.1	8.9
.....	5.7	4.0	4.7	9.9	5.4	3.3	2.0	3.5	2.9	6.8	5.2	8.3
.....	5.5	4.1	4.6	9.7	5.4	3.1	1.9	3.2	2.3	6.9	5.2	12.0
.....	6.1	4.1	4.4	9.3	5.3	3.0	2.2	2.9	2.1	6.1	5.1	11.9
.....	7.3	4.1	4.3	8.8	5.4	3.3	2.4	2.5	2.1	6.7	5.4	11.9
.....	7.7	4.1	4.1	7.9	5.3	3.2	2.4	8.0	2.0	5.1	8.6	9.2
.....	7.5	4.1	3.8	7.2	5.3	3.2	2.4	7.0	2.4	5.7	9.4	8.2
.....	8.0	4.2	4.0	6.9	.....	3.3	2.2	5.2	2.7	5.8	9.8	7.2
.....	9.65	4.4	4.1	6.5	.....	3.4	2.1	4.8	3.0	6.1	10.1	6.8
.....	12.2	4.6	4.0	6.3	4.4	3.3	2.4	4.2	3.0	6.7	9.5	6.3
.....	13.0	4.7	4.0	6.0	.....	3.1	2.5	4.8	2.8	5.2	8.6	5.6
.....	12.3	5.4	3.9	5.7	4.1	2.9	2.3	4.2	2.8	5.0	7.5	5.7
.....	11.2	5.8	4.1	5.6	4.0	2.9	2.0	3.8	2.9	5.8	6.8	5.1
.....	9.6	5.2	6.6	5.4	4.6	2.8	1.9	3.6	2.3	6.8	6.3	5.3
.....	8.3	4.9	13.8	5.5	4.7	2.7	2.3	3.3	2.4	6.8	6.0	6.5
.....	7.5	.....	14.0	5.3	4.8	2.8	2.2	3.1	2.5	6.9	5.2	5.9
.....	6.0	.....	12.6	4.9	4.9	2.7	2.2	2.9	2.5	7.5	5.7	5.5
.....	6.5	.....	13.6	.....	5.0	.....	2.1	2.7	.....	7.9	.....	7.4

OTE.—Discharge probably unaffected by ice conditions.

Rating table for Allegheny River at Kittanning, Pa., for 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.90	1,650	3.30	4,165	4.70	8,435	7.20	19,390
2.00	1,740	3.40	4,425	4.80	8,795	7.40	20,400
2.10	1,840	3.50	4,690	4.90	9,165	7.60	21,420
2.20	1,960	3.60	4,960	5.00	9,545	7.80	22,470
2.30	2,095	3.70	5,235	5.20	10,320	8.00	23,540
2.40	2,245	3.80	5,515	5.40	11,130	9.00	29,030
2.50	2,410	3.90	5,805	5.60	11,970	10.00	34,730
2.60	2,590	4.00	6,105	5.80	12,830	11.00	40,700
2.70	2,785	4.10	6,415	6.00	13,720	12.00	47,150
2.80	2,990	4.20	6,735	6.20	14,620	13.00	54,280
2.90	3,205	4.30	7,065	6.40	15,540	14.00	62,110
3.00	3,430	4.40	7,400	6.60	16,470		
3.10	3,665	4.50	7,740	6.80	17,430		
3.20	3,910	4.60	8,085	7.00	18,410		

TE.—The above table is applicable only for open-channel conditions. It is based on 25 discharge urements made during 1904–1906. It is well defined between gage heights 2.25 feet and 29 feet. At igher stages the rating curve was drawn through measurements made on the falling stage of the in the 1905 spring flood, and hence is not strictly applicable to the stationary or rising stages of but since the maximum stage for 1906 was only 14 feet there is only very slight error in the monthly arge from this cause.

Monthly discharge of Allegheny River at Kittanning, Pa., for 1906.

[Drainage area, 8,690 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dept inet
January	54,300	11,100	25,000	2.88	
February	15,100	5,800	7,950	.914	
March	62,100	5,520	16,000	1.84	
April	55,800	9,160	27,800	3.20	
May [a]	18,900	6,100	10,600	1.22	
June [a]	30,700	2,780	6,600	.760	
July	2,410	1,650	2,070	.238	
August	23,500	1,740	6,200	.713	
September	4,960	1,740	2,890	.333	
October	23,000	2,410	13,600	1.57	
November	35,300	7,740	16,400	1.89	
December	60,500	9,540	24,900	2.87	
The year	62,100	1,650	13,300	1.54	

[a] Discharge interpolated May 21, 22, and 24 and June 4.

NOTE.—Values for 1906 are excellent.

BLACKLICK CREEK AT BLACKLICK, PA.

This station was established August 16, 1904, and was discontin July 15, 1906. It was located at the covered wooden highway bri one-fourth mile from the railway station at Blacklick, Pa. Dur September, 1905, this bridge was torn down and replaced. The g was read once each day by Mark Maynard until April 17, after wh D. J. Walling was the observer. The conditions at this station a the bench marks are described in Water-Supply Paper No. 169, p 32, where are given also references to publications that contain d for previous years.

The following discharge measurement was made from the n bridge May 23, 1906:

Width, 210 feet; area, 373 square feet; gage height, 2.40 feet; discharge, 118 sec feet.

Daily gage height, in feet, of Blacklick Creek at Blacklick, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	J
1	4.1	3.3	3.3	6.2	2.2	2.0	17	3.8	2.1	3.3	3.7	2.4	
2	3.8	.....	4.2	7.3	3.7	1.9	18	4.1	.....	3.2	3.6	2.3	
3	4.0	.....	5.4	4.6	4.1	1.88	19	4.6	.....	3.3	3.4	2.1	
4	6.2	.....	4.2	4.2	3.6	1.85	20	4.1	.....	3.1	3.2	2.0	
5	5.0	.....	3.5	4.6	3.2	1.8	21	4.2	2.8	3.1	3.2	2.0	
6	4.6	.....	3.1	5.4	3.0	2.15	22	4.3	3.7	3.0	3.1	2.0	
7	4.0	.....	3.4	5.3	2.9	3.4	23	6.2	3.2	2.7	2.9	1.9	
8	3.9	.....	3.3	6.2	2.7	2.8	24	5.3	3.1	2.7	2.8	1.9	
9	3.5	.....	3.5	7.6	2.7	2.4	25	4.7	3.3	2.9	2.7	1.8	
10	3.4	.....	3.4	.....	2.7	2.3	26	4.2	3.4	4.3	2.6	1.8	
11	3.6	.....	3.3	.....	2.6	2.75	27	3.8	3.4	7.1	2.5	2.5	
12	3.6	.....	3.2	4.2	2.5	2.4	28	3.7	3.3	7.2	2.5	2.8	
13	3.8	.....	3.1	3.7	2.5	2.15	29	3.6	.....	5.1	2.4	2.5	
14	3.4	4.3	3.3	4.6	2.5	2.08	30	3.4	.....	6.2	2.2	2.1	
15	3.4	.....	3.2	4.7	2.5	2.1	31	3.4	.....	7.8	.....	2.0	
16	3.9	.....	3.2	4.5	2.4	2.0							

NOTE.—Creek frozen February 2 to 20; ice attained a thickness of about 0.5 foot; see footnot *monthly* discharge table.

Rating table for Blacklick Creek at Blacklick, Pa., for 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.80	21	3.00	354	4.20	1,327	5.80	3,310
1.90	35	3.10	403	4.30	1,432	6.00	3,590
2.00	51	3.20	460	4.40	1,540	6.20	3,870
2.10	69	3.30	525	4.50	1,650	6.40	4,160
2.20	89	3.40	597	4.60	1,765	6.60	4,450
2.30	112	3.50	676	4.70	1,880	6.80	4,740
2.40	138	3.60	759	4.80	2,000	7.00	5,040
2.50	167	3.70	846	4.90	2,120	7.20	5,340
2.60	199	3.80	936	5.00	2,245	7.40	5,650
2.70	233	3.90	1,029	5.20	2,500	7.60	5,970
2.80	270	4.00	1,125	5.40	2,765	7.80	6,290
2.90	310	4.10	1,224	5.60	3,035		

OTE.—The above table is applicable only for open-channel conditions. It is based on 11 discharge asurements made during 1904-6. It is fairly well defined between gage heights 1.8 feet and 5.0 feet. table may be somewhat in excess of the true values, owing to a change in the conditions of flow ing the erection of the new bridge in the latter part of 1905. Two measurements made at the new ge give values that are nearly 15 per cent lower than the rating.

Monthly discharge of Blacklick Creek at Blacklick, Pa., for 1906.

[Drainage area, 403 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary	3,870	597	1,310	3.25	3.75
ruary 21-28	846	270	528	1.31	.39
rch	6,290	233	1,300	3.23	3.72
il	5,970	89	1,640	4.07	4.54
y	1,220	21	227	.563	.65
e	1,330	21	178	.442	.49

OTE.—Values for January, February, and March, good; from February 2 to 20 the flow probably ied from about 200 to 400 sec.-ft.; values for April, May, and June are probably considerably too low, ng to inexperience of new observer, who was appointed April 12.

MONONGAHELA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Monongahela River is formed near Fairmont, Marion County, in e northern part of West Virginia, by the union of its West Fork th Tygarts Valley River. The headwaters of the latter stream lie the slopes and in the valleys of the Appalachian Mountains near e eastern boundary of West Virginia; thence they flow northward, aining a hilly and mountainous country. West Fork has its headters west of those of Tygarts Valley River, in the central part of est Virginia; thence they flow northward, draining a hilly country. The principal tributaries of Monongahela River below Fairmont Cheat and Youghiogheny rivers, both entering from the east. eat River drains a rugged, mountainous district in northern West ginia and flows into Monongahela River near Point Marion, Pa. ughiogheny River drains a mountainous district of Maryland and nsylvania and enters the Monongahela about 15 miles above

Pittsburg. The basins of all these tributary rivers have steep slopes and collect and discharge their waters quickly, with the result that the Monongahela is liable to the excessive freshets for which it is noted. The whole basin was once heavily timbered, but has been thoroughly cleared except about the upper waters of the principal streams. Little water power is used in the basin. Navigation extends to Fairmont.

YOUGHIOGHENY RIVER NEAR CONFLUENCE, PA.

This station was established September 15, 1904. It is located at the highway bridge about one-half mile from the railway station at Confluence, Pa. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 40, where are given also references to publications that contain data for previous years.

The following discharge measurement was made May 25, 1906:

Width, 188 feet; area, 163 square feet; gage height, 1.86 feet; discharge, 200 second-feet.

Daily gage height, in feet, of Youghiogheny River near Confluence, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.6	2.6	2.5	6.1	3.1	2.45	2.45	2.2	1.9	1.8	2.1	2.3
2	2.5	2.5	2.5	5.1	3.3	2.5	2.4	2.1	1.9	1.75	2.2	2.3
3	2.85	2.45	2.5	4.8	3.2	2.35	2.2	2.4	1.8	1.75	1.95	2.65
4	5.35	2.4	2.75	4.8	3.0	2.25	2.15	2.1	1.8	1.85	1.8	2.5
5	4.4	2.35	3.4	5.2	2.9	2.2	2.15	2.0	1.75	2.1	1.8	2.35
6	3.7	2.25	3.2	7.0	2.8	4.4	2.1	1.9	1.7	2.2	1.85	3.3
7	3.3	2.15	3.0	5.5	2.7	5.2	2.0	1.9	1.7	2.35	1.8	4.1
8	3.2	1.9	2.85	4.5	2.6	3.9	1.95	4.4	1.65	2.25	1.75	3.5
9	2.7	1.9	2.75	4.4	2.6	3.35	1.9	7.4	1.65	2.1	1.75	3.1
10	2.5	1.95	2.75	5.75	2.6	2.9	1.9	8.2	1.8	2.05	1.8	6.4
11	2.7	2.0	2.8	4.8	2.55	2.7	1.85	5.1	1.8	2.0	1.8	8.1
12	3.3	2.0	2.85	4.1	2.5	2.6	1.85	3.9	1.6	2.0	1.85	5.55
13	2.7	2.15	2.75	3.8	2.4	2.5	1.8	3.4	1.65	1.95	1.8	4.4
14	2.7	2.1	2.7	3.6	2.3	2.4	1.8	3.0	2.0	1.95	1.8	3.95
15	2.75	2.05	2.75	5.2	2.25	2.35	1.75	2.8	1.8	1.9	1.85	3.65
16	2.85	2.05	2.75	4.7	2.2	2.25	1.75	2.55	1.7	1.9	1.9	[illegible]
17	3.55	2.0	2.7	4.1	2.15	2.15	1.75	2.55	1.65	1.85	2.0	5.85
18	3.8	2.05	2.65	3.7	2.1	2.1	1.8	2.5	1.95	1.85	3.0	6.4
19	4.35	2.1	2.7	3.4	2.1	2.05	1.7	2.7	1.9	1.85	3.5	4.8
20	3.8	2.2	2.75	3.1	2.05	2.3	1.7	3.6	1.9	2.0	4.4	4.1
21	3.8	2.2	2.6	3.1	2.0	3.1	1.7	4.0	1.85	2.3	4.0	3.9
22	3.85	2.4	2.5	3.2	2.0	2.9	1.8	3.15	1.85	2.4	3.35	3.6
23	10.0	2.65	2.5	3.35	1.95	2.8	2.8	2.7	1.85	2.3	2.9	3.25
24	6.4	2.6	2.8	3.4	1.9	2.8	2.4	2.6	1.8	2.15	2.7	3.0
25	4.8	2.45	3.0	3.4	1.85	2.6	2.2	2.6	1.8	2.05	2.55	2.8
26	4.0	2.3	2.7	3.4	1.85	2.5	2.0	2.35	1.75	1.95	2.45	2.8
27	3.5	2.3	5.5	4.65	1.8	2.5	1.8	2.35	1.75	1.95	2.35	2.85
28	3.3	2.35	8.0	3.9	2.3	2.45	1.75	2.25	1.7	1.9	2.3	3.5
29	3.1	.....	6.4	3.5	2.35	2.75	1.7	2.15	1.7	1.95	2.25	4.9
30	2.9	.....	7.7	3.25	2.3	2.5	2.5	2.1	1.8	2.05	2.2	5.35
31	2.8	.....	8.6	.....	2.4	.....	2.3	2.0	.....	2.1	.....	7.5

NOTE.—Discharge probably unaffected by ice conditions.

Rating table for Youghiogheny River near Confluence, Pa., for 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	118	2.90	896	4.20	2,125	6.00	4,460
1.70	156	3.00	974	4.30	2,237	6.20	4,760
1.80	199	3.10	1,055	4.40	2,351	6.40	5,070
1.90	247	3.20	1,139	4.50	2,467	6.60	5,390
2.00	299	3.30	1,226	4.60	2,585	6.80	5,710
2.10	354	3.40	1,316	4.70	2,605	7.00	6,040
2.20	412	3.50	1,407	4.80	2,727	7.20	6,375
2.30	473	3.60	1,501	4.90	2,851	7.40	6,715
2.40	537	3.70	1,598	5.00	3,077	7.60	7,065
2.50	604	3.80	1,698	5.20	3,337	7.80	7,420
2.60	674	3.90	1,801	5.40	3,604	8.00	7,780
2.70	746	4.00	1,907	5.60	3,880	9.00	9,620
2.80	820	4.10	2,015	5.80	4,166	10.00	11,510

ɪɪ.—The above table is applicable only for open-channel conditions. It is based on 12 discharge ırements made during 1904-1906. It is well defined between gage heights 1.3 feet and 7.0 feet. ɪ gage height 4.0 feet the discharge values in this table may occasionally be too great on account ɪkwater from Casselman River.

Monthly discharge of Youghiogheny River near Confluence, Pa., for 1906.

[Drainage area, 435 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ry	11,500	604	1,800	4.14	4.77
ary	710	247	436	1.00	1.04
	8,880	604	1,720	3.95	4.55
	6,040	1,060	2,320	5.33	5.95
	1,230	199	554	1.27	1.46
	3,340	326	822	1.89	2.11
	820	156	310	.713	.82
t	8,140	247	1,270	2.92	3.37
ıber	299	118	193	.444	.50
ɜr	537	178	313	.720	.83
ıber	2,350	178	553	1.27	1.42
ber	7,960	473	2,250	5.17	5.96
The year	11,500	118	1,050	2.40	32.78

ɪ.—Values for 1906 are excellent. Above gage height 4.0 feet there is occasionally backwater 'asselman River. With the data at hand it has been impossible to detect the time of occurrence condition, hence the rating for free flow has been used for all stages.

CASSELMAN RIVER AT CONFLUENCE, PA.

ıis station was established September 15, 1904. It is located at highway bridge in Confluence, Pa., about 500 yards from the oad station. The conditions at this station and the bench ks are described in Water-Supply Paper No. 169, page 43, where given also references to publications that contain data for pre- s years.

The following discharge measurement was made May 25, 1906

Width, 212 feet; area, 166 square feet; gage height, 1.87 feet; discharge, 175 sec feet.

Daily gage height, in feet, of Casselman River at Confluence, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.5	2.5	2.0	5.2	2.5	2.05	1.8	2.0	2.1	1.9	2.0
2	2.45	2.35	2.15	4.5	2.7	2.1	1.9	1.95	2.15	2.0	2.0
3	2.7	2.45	2.35	4.4	2.75	2.05	1.8	3.85	2.1	1.95	1.9
4	4.55	2.3	2.9	4.5	2.6	2.05	1.85	2.8	2.0	1.9	1.8
5	3.7	2.45	2.7	4.9	2.6	2.0	1.8	2.4	1.95	2.1	1.8
6	3.05	2.3	2.5	6.5	2.45	4.1	1.75	2.15	1.9	2.1	1.8
7	2.65	2.2	2.6	4.7	2.5	4.9	1.75	2.5	1.85	2.2	1.75
8	2.8	2.1	2.55	3.85	2.4	3.35	1.7	4.65	1.8	2.1	1.75
9	2.5	2.0	2.55	3.9	2.3	2.7	1.6	7.8	1.8	1.95	1.75
10	2.25	2.05	2.5	5.05	2.45	2.4	1.6	8.8	2.0	1.9	1.75
11	2.65	2.05	2.45	4.2	2.35	2.25	1.65	4.9	2.0	1.9	1.8
12	2.6	2.1	2.7	3.6	2.2	2.2	1.6	3.65	1.8	1.85	1.8
13	2.6	2.15	2.6	3.3	2.25	2.15	1.6	3.2	1.85	1.85	1.85
14	2.5	2.0	2.6	3.1	2.25	2.1	1.6	2.8	2.0	1.85	1.85
15	2.45	2.1	2.6	4.7	2.1	2.1	1.6	2.6	2.0	1.8	1.9
16	2.65	2.1	2.45	4.0	2.15	2.05	1.6	2.45	1.9	1.8	1.9
17	2.9	2.05	2.55	3.5	2.15	2.05	1.6	2.45	1.75	1.8	1.95
18	3.3	2.05	2.5	3.2	2.0	2.0	1.7	2.4	1.9	1.8	2.7
19	3.85	2.0	2.5	3.0	2.1	2.0	1.7	3.6	1.9	1.8	3.1
20	3.15	2.1	2.45	2.8	2.05	2.1	1.65	4.0	1.85	2.6	3.25
21	3.2	2.2	2.35	3.1	1.95	2.4	1.6	4.1	1.8	2.45	2.9
22	3.3	2.7	2.4	2.15	2.0	2.2	1.75	3.3	1.8	2.35	2.6
23	9.9	2.3	2.35	3.25	1.95	2.25	2.6	2.95	1.75	2.25	2.4
24	4.7	2.2	2.3	3.1	1.8	2.15	2.15	2.7	1.75	2.15	2.35
25	4.1	2.25	2.35	2.9	1.85	2.05	1.9	2.9	1.7	2.05	2.3
26	3.5	2.25	2.3	3.2	1.85	2.0	1.75	2.65	1.7	2.0	2.25
27	3.2	2.2	4.8	3.2	1.8	1.95	1.75	2.6	1.75	2.0	2.2
28	3.05	2.15	7.4	2.8	2.1	1.9	1.7	2.55	1.8	2.0	2.2
29	2.9	.....	5.6	2.85	2.15	1.9	1.7	2.4	1.7	2.05	2.15
30	2.65	.....	7.0	2.5	2.1	1.8	1.9	2.3	1.75	2.0	2.1
31	2.7	.....	7.7	.....	2.1	.....	2.0	2.2	.....	2.0	.....

NOTE.—Discharge probably unaffected by ice conditions during 1906.

Rating table for Casselman River at Confluence, Pa., for 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	58	2.30	491	3.00	1,175	3.70	1,935
1.70	95	2.40	579	3.10	1,281	3.80	2,045
1.80	141	2.50	671	3.20	1,388	3.90	2,155
1.90	196	2.60	767	3.30	1,496	4.00	2,265
2.00	260	2.70	866	3.40	1,605		
2.10	331	2.80	967	3.50	1,715		
2.20	408	2.90	1,070	3.60	1,825		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 12 disch measurements made during 1904-1906. It is well defined between gage heights 1.5 feet and 4 feet. Ow to frequent backwater from Youghiogheny River the discharge values for higher gage heights are li to be in considerable error.

Monthly discharge of Casselman River at Confluence, Pa., for 1906.

[Drainage area, 450 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	10,000	450	1,510	3.36	3.87
.....	866	260	417	.927	.97
.....	6,500	260	1,270	2.82	3.25
.....	5,200	370	1,970	4.38	4.89
.....	916	141	435	.967	1.11
.....	3,500	141	560	1.24	1.38
.....	767	58	139	.309	.36
.....	9,500	228	1,650	3.67	4.23
.....	370	95	186	.413	.46
.....	767	141	282	.627	.72
.....	1,440	118	395	.878	.98
.....	7,600	370	1,890	4.20	4.84
year.....	10,000	58	892	1.98	27.06

Values are rated as follows: Monthly means, excellent; discharge above gage height 5.0

age height 4.0 feet there is frequently backwater at this station from the Youghiogheny o rating table has been used for these stages, and the daily discharge values are based on of the relative gage heights on Casselman and Youghiogheny rivers. This study shows that metimes free flow at the Casselman station, but more often backwater.

LAUREL HILL CREEK AT CONFLUENCE, PA.

station was established September 15, 1904. It is located at ;hway bridge near the tannery, about one-fourth mile from the d station at Confluence, Pa. The conditions at this station e bench marks are described in Water-Supply Paper No. 169, 5, where are given also references to publications that contain ›r previous years.

The following discharge measurement was made May 26, 1906:

Width, 82 feet; area, 116 square feet; gage height, 1.96 feet; discharge, 53 second-fe

Daily gage height, in feet, of Laurel Hill Creek at Confluence, Pa., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	2.55	2.3	2.5	3.6	2.3	2.1	1.95	1.85	2.05	1.95	1.8	
2	2.45	2.25	2.5	3.3	2.5	2.05	1.9	1.85	2.05	2.1	1.8	
3	2.7	2.25	2.5	3.4	2.6	1.95	1.85	2.0	2.1	2.0	1.8	
4	4.0	2.3	2.6	3.5	2.4	1.85	1.9	2.0	2.0	1.9	1.8	
5	3.2	2.3	2.5	3.8	2.35	1.8	1.85	1.9	1.9	2.0	1.8	
6	2.85	2.25	2.5	4.6	2.3	3.2	1.8	1.8	1.9	2.1	1.75	
7	2.65	2.25	2.5	3.5	2.3	3.5	1.8	4.0	1.85	2.3	1.75	
8	2.7	2.2	2.5	3.15	2.25	3.0	1.8	3.8	1.8	2.1	1.75	
9	2.5	2.2	2.5	3.3	2.35	2.5	1.8	4.8	1.8	1.95	1.75	
10	2.3	2.25	2.4	3.75	2.4	2.4	1.8	5.9	2.15	1.95	1.7	
11	2.25	2.2	2.5	3.3	2.35	2.25	1.75	3.6	2.0	1.9	1.8	
12	2.4	2.15	2.6	3.0	2.3	2.2	1.75	2.95	1.75	1.9	1.8	
13	2.35	2.15	2.5	2.45	2.3	2.2	1.7	2.7	1.8	1.85	1.8	
14	2.3	2.15	2.5	2.1	2.25	2.2	1.7	2.45	1.8	1.85	1.8	
15	2.35	2.1	2.5	3.6	2.25	2.15	1.75	2.35	2.0	1.8	1.8	
16	2.45	2.1	2.45	2.9	2.2	2.1	1.75	2.25	1.85	1.8	1.9	
17	2.55	2.1	2.45	2.75	2.2	2.05	1.7	2.25	1.75	1.8	2.0	
18	2.9	2.05	2.4	2.65	2.2	2.0	1.9	2.4	1.7	1.8	3.0	
19	3.05	2.05	2.4	2.6	2.15	2.0	2.0	3.45	1.7	1.8	3.4	
20	2.75	2.05	2.35	2.5	2.1	2.0	1.85	3.3	1.65	1.95	2.95	
21	2.9	2.3	2.35	2.6	2.05	2.1	1.7	3.25	1.8	2.1	2.75	
22	2.9	2.75	2.4	2.65	2.0	2.1	1.9	2.95	1.75	1.9	2.6	
23	7.0	2.6	2.35	2.8	2.0	2.3	2.7	2.75	1.75	1.85	2.35	
24	3.75	2.5	2.3	2.75	1.95	2.25	2.35	2.6	1.7	1.85	2.3	
25	3.15	2.45	2.3	2.7	1.95	2.1	2.1	2.5	1.75	1.8	2.3	
26	2.85	2.4	2.45	2.7	1.95	2.0	2.0	2.4	1.75	1.75	2.25	
27	2.7	2.35	3.6	2.6	2.05	2.05	1.95	2.3	1.75	1.75	2.2	
28	2.6	2.3	5.0	2.5	2.7	2.0	1.9	2.25	1.8	1.85	2.2	
29	2.5	.....	3.8	2.4	2.35	2.0	1.9	2.2	1.75	1.85	2.15	
30	2.45	.....	4.7	2.4	2.25	1.95	2.0	2.15	1.8	1.85	2.1	
31	2.4	.....	5.4	.....	2.15	.....	1.9	2.1	.....	1.8	.....	

NOTE.—Discharge probably unaffected by ice conditions during 1906.

Rating table for Laurel Hill Creek at Confluence, Pa., for 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	7	2.10	93	2.50	266	2.90	503
1.70	13	2.20	128	2.60	321	3.00	568
1.80	24	2.30	169	2.70	379	3.10	634
1.90	41	2.40	215	2.80	440	3.20	701
2.00	64						

The above table is applicable only for open-channel conditions. It is based on 13 discharge measurements made during 1904–1906. It is well defined between gage heights 1.8 feet and 3.2 feet. Above gage height 3.2 feet the discharge values are usually more or less in error on account of backwater from Casman and Youghiogheny rivers.

Monthly discharge of Laurel Hill Creek at Confluence, Pa., for 1906.

[Drainage area, 118 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	2,800	148	467	3.96	4.56
.....	410	78	159	1.35	1.41
.....	2,000	169	446	3.78	4.36
.....	1,600	93	582	4.93	5.50
.....	379	52	153	1.30	1.50
.....	950	24	170	1.44	1.61
.....	379	13	51.8	.439	.51
.....	2,000	24	445	3.77	4.35
.....	110	10	35.3	.299	.33
.....	169	18	47.4	.402	.46
.....	800	13	142	1.20	1.34
.....	2,000	169	613	5.19	5.98
ear.....	2,800	10	276	2.34	31.91

'alues are rated as follows: Monthly means, excellent; discharge above gage height 3.5 feet, 'e gage height 3.2 feet there is usually backwater at this station from Youghiogheny and rivers. No rating table has been used for these stages, the daily discharge values being he relative run-off from the Casselman and Youghiogheny river drainage basins for low

BEAVER RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

er River is formed by the junction of Mahoning and Shenango ust below Newcastle, Pa. Mahoning River flows through a ıd important territory. There are numerous water-power ments on it, and it forms an important adjunct in the water and sewage disposal of many towns along its course.

MAHONING RIVER AT YOUNGSTOWN, OHIO.

station was established May 23, 1903, and was discontinued , 1906. It is located about 2 miles below the center of the city ngstown, Ohio, at the highway bridge near the plant of the ın Steel Company. The conditions at this station and the narks are described in Water-Supply Paper No. 169, page 48, ıre given also references to publications that contain data for s years.

Discharge measurements of Mahoning River at Youngstown, Ohio, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft*
March 7	E. F. Kriegaman	160	655	2.67	1,
May 14	do	153	391	1.19	

Mean daily gage height, in feet, of Mahoning River near Youngstown, Ohio, for 1906

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Jul
1	1.7	1.35	1.8	5.55	1.0	0.8	
2	1.55	1.15	4.8	3.75	.95	.8	
3	1.7	1.2	4.2	2.65	.9	.75	
4	4.35	1.1	4.5	2.2	.95	.85	
5	5.55	1.05	4.8	1.85	3.75	.7	
6	3.4	1.0	4.2	2.2	3.95	.7	
7	2.05	.95	3.5	2.1	2.7	.75	
8	1.9	1.0	2.4	2.25	2.2	.7	
9	1.6	.9	2.35	2.4	2.05	1.0	
10	1.45	.8	2.0	3.15	1.9	.9	
11	1.25	.75	1.85	4.35	1.65	.95	
12	1.25	.7	1.35	3.35	1.45	.9	
13	1.15	.8	1.75	2.85	1.4	.9	
14	1.05	.85	1.7	2.35	1.15	.85	
15	1.1	1.2	1.7	2.2	1.2	1.0	
16	1.7	1.4	1.6	2.15	1.1	.95	
17	2.05	1.35	1.45	2.05	1.1	.8	
18	2.4	1.3	1.4	1.9	1.05	.75	
19	2.95	1.2	1.55	1.8	1.0	.8	
20	3.15	1.15	1.35	1.7	1.05	.95	
21	3.65	1.5	1.3	1.65	1.0	.85	
22	3.4	2.1	1.45	1.5	.95	.85	
23	3.15	2.5	1.35	1.3	.95	.8	
24	3.8	2.45	1.5	1.3	.9	.8	....
25	2.5	2.65	1.65	1.25	.85	.75	...
26	2.0	2.0	1.7	1.2	.8	.75	.....
27	1.7	1.75	9.2	1.2	.7	.8	....
28	1.55	1.45	11.55	1.15	.7	.85	.....
29	1.45	.....	11.4	1.2	.75	.9	.....
30	1.3	.....	8.3	1.1	.8	.85	.....
31	1.25	.....	6.45	.....	.75	.....	...

NOTE.—No ice conditions at this station.

Rating table for Mahoning River at Youngstown, Ohio, for 1905 and 1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.70	113	2.10	938	3.50	2,110	5.80	4,630
.80	151	2.20	1,014	3.60	2,210	6.00	4,870
.90	195	2.30	1,091	3.70	2,310	6.20	5,130
1.00	244	2.40	1,170	3.80	2,410	6.40	5,390
1.10	296	2.50	1,250	3.90	2,510	6.60	5,650
1.20	350	2.60	1,330	4.00	2,610	6.80	5,910
1.30	406	2.70	1,410	4.20	2,810	7.00	6,180
1.40	464	2.80	1,490	4.40	3,030	8.00	7,580
1.50	524	2.90	1,575	4.60	3,250	9.00	9,080
1.60	586	3.00	1,660	4.80	3,470	10.00	10,600
1.70	651	3.10	1,745	5.00	3,690	11.00	12,200
1.80	719	3.20	1,830	5.20	3,910	12.00	13,900
1.90	790	3.30	1,920	5.40	4,150		
2.00	863	3.40	2,010	5.60	4,390		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 22 dischs measurements made during 1903–1906. It is fairly well defined between gage heights 0.9 foot and 2.5 f The table beyond these limits is based on 1 measurement at 7.8 and 1 at 10.8 feet, the latter being rec puted by the use of low-water soundings. Below 0.9 foot the curve is unsatisfactory, probably ov *to the influence of* the dam below, as at low stages the water may fall below the crest.

Monthly discharge of Mahoning River at Youngstown, Ohio, for 1906.

[Drainage area, 968 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	4,330	270	1,120	1.17	1.35
February	1,370	113	463	.483	.50
March	13,100	406	2,560	2.67	3.08
April	4,330	296	1,080	1.13	1.26
May	2,560	113	552	.576	.66
June	244	113	167	.174	.19
July 1-23	494	113	228	.238	.20

NOTE.- Values are rated as follows: January to May, good; June to July, fair.

MUSKINGUM RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Muskingum River is formed by the junction of Walhonding and Tuscarawas rivers in the east-central part of Ohio, flows southward, and enters Ohio River at Marietta, Ohio. The river is navigable below Zanesville, and the dams which were built as an aid to navigation are used for water power. There are good reservoir sites on some of the tributaries, and these could be used for storing water to augment the low-water flow. The records of the stations in this basin are of value accordingly.

MUSKINGUM RIVER AT ZANESVILLE, OHIO.

This station was established March 11, 1905. It is located at the Sixth Street Bridge, Zanesville, Ohio, 1,000 feet above the lowest lock which is maintained by the War Department, which furnishes the gage heights. It is about 3,000 feet below a dam and about the same distance below the entrance of Licking River, which also has a dam near its mouth. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 50.

Discharge measurements of Muskingum River at Zanesville, Ohio, in 1905 and 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
March 11	R. W. Pratt	531	6,270	16.85	25,800
March 16	do	510	2,840	9.75	6,410
March 16	E. C. Murphy	501	2,660	9.83	6,300
May 21	M. S. Brennan	472	2,920	10.50	8,420
June 13	S. K. Clapp	489	4,680	13.20	17,400
July 9	do		2,470	9.20	5,630
August 28	R. W. Pratt	475	2,280	8.70	3,640
October 30	do	495	2,180	8.60	2,930
November 14	do		2,280	8.75	3,500
1906.					
February 12[a]	Brennan and Kriegsman	469	1,810	8.35	2,310
March 5	E. F. Kriegsman	415	3,430	11.92	12,900
April 9	do	493	3,340	11.00	9,080
May 22	do	485	1,980	8.20	2,350
June 6	Murphy and Kriegsman	487	2,000	7.90	1,720

[a] Ice along shores at time of this measurement.

Daily gage height, in feet, of Muskingum River at Zanesville, Ohio, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	9.8	9.0	9.0	21.2	9.5	8.0	8.2	8.5	8.1	8.4	8.5
2	9.3	8.9	8.8	19.0	9.2	8.0	8.0	8.2	8.0	8.6	8.4
3	9.5	8.5	9.3	16.95	9.1	8.0	7.9	8.0	8.1	9.0	8.4
4	13.1	8.4	11.8	14.8	9.1	7.9	8.0	7.9	8.1	8.6	8.3
5	14.25	8.7	11.85	13.0	9.0	7.8	8.1	7.8	8.8	8.8	8.3
6	14.2	8.55	11.1	12.35	8.8	7.8	8.1	7.7	8.7	8.5	8.2
7	13.4	8.3	11.1	12.0	8.9	7.8	8.0	7.7	8.3	8.8	8.1
8	11.2	8.4	9.9	11.87	8.9	8.1	8.0	8.4	8.0	9.0	8.1
9	9.9	8.4	9.8	11.1	8.8	8.1	8.3	10.2	7.8	9.5	8.1
10	9.2	8.5	9.7	10.9	8.7	8.0	8.2	9.9	7.9	9.5	8.2
11	9.4	8.2	9.5	10.9	8.6	7.9	8.1	10.1	7.9	9.2	8.1
12	9.6	8.3	9.4	10.8	8.6	7.8	8.1	9.7	7.8	9.3	8.1
13	9.4	8.5	9.4	10.3	8.5	7.7	7.9	9.2	7.8	9.1	8.1
14	10.1	8.5	9.2	10.1	8.5	7.7	7.9	8.7	7.8	8.7	8.1
15	11.0	8.4	9.2	10.4	8.5	7.7	7.8	8.4	7.6	8.6	8.1
16	12.9	8.5	9.1	10.6	8.5	7.7	8.1	8.3	7.6	8.4	8.3
17	13.3	8.6	9.1	10.5	8.4	7.6	8.8	8.0	7.6	8.4	8.3
18	12.85	8.8	9.0	10.0	8.3	7.8	8.9	8.7	7.8	8.3	8.5
19	12.2	8.6	9.1	9.7	8.2	7.8	9.3	10.1	7.8	8.5	9.5
20	11.7	8.5	9.5	9.5	8.1	8.1	9.5	10.5	7.9	9.1	10.4
21	11.2	8.5	9.8	9.3	8.2	8.2	9.3	10.4	8.0	9.5	11.1
22	10.9	8.2	10.3	9.1	8.1	8.2	9.5	10.1	8.1	9.7	14.3
23	10.8	10.0	10.5	9.0	8.0	8.3	9.0	10.1	8.3	9.2	13.4
24	10.5	10.1	10.1	8.9	8.0	8.6	8.7	10.5	8.1	8.9	12.0
25	10.2	10.0	9.7	8.9	8.0	8.7	8.5	10.1	8.0	8.7	11.0
26	9.9	9.9	10.1	9.4	8.0	8.4	8.2	9.6	7.9	8.6	10.4
27	9.6	9.7	17.55	10.4	7.8	8.1	8.1	9.2	7.8	8.5	9.9
28	9.3	9.2	23.95	11.2	8.4	8.4	7.9	8.9	7.8	8.4	9.5
29	9.2	.....	22.4	10.9	8.1	8.0	8.1	8.6	7.9	8.6	9.3
30	9.1	.....	22.25	10.1	8.0	8.0	8.2	8.4	7.9	8.6	9.1
31	9.1	.....	23.1	.....	8.0	.....	8.0	8.3	.....	8.6	.....

NOTE.—Flow slightly affected by ice conditions during February.

Rating table for Muskingum River at Zanesville, Ohio, for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
7.60	1,180	9.10	4,380	10.60	8,370	13.20	17,380
7.70	1,370	9.20	4,620	10.70	8,670	13.40	18,140
7.80	1,560	9.30	4,860	10.80	8,980	13.60	18,920
7.90	1,760	9.40	5,110	10.90	9,290	13.80	19,700
8.00	1,960	9.50	5,370	11.00	9,600	14.00	20,500
8.10	2,160	9.60	5,610	11.20	10,230	15.00	24,600
8.20	2,370	9.70	5,870	11.40	10,870	16.00	29,000
8.30	2,580	9.80	6,130	11.60	11,530	17.00	33,700
8.40	2,790	9.90	6,390	11.80	12,210	18.00	38,000
8.50	3,000	10.00	6,660	12.00	12,900	19.00	42,500
8.60	3,220	10.10	6,930	12.20	13,610	20.00	47,100
8.70	3,440	10.20	7,210	12.40	14,340	21.00	51,700
8.80	3,670	10.30	7,490	12.60	15,080	22.00	56,300
8.90	3,900	10.40	7,780	12.80	15,840	23.00	60,900
9.00	4,140	10.50	8,070	13.00	16,600	24.00	65,600

NOTE.—The above table is applicable only for open-channel conditions. It is based on disch measurements made during 1905 and 1906. It is well defined between gage heights 7.9 feet and 14.0

hly discharge of Muskingum River at Zanesville, Ohio, for 1905 and 1906.

[Drainage area, 5,830 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
.....	11,500	2,790	5,260	0.902	0.74
.....	40,200	2,370	11,200	1.92	2.21
.....	25,500	3,220	9,780	1.68	1.87
.....	6,660	1,960	3,480	.597	.69
.....	21,300	1,370	4,560	.782	.90
.....	11,900	1,370	4,280	.734	.82
.....	14,300	1,960	4,300	.738	.85
.....	15,800	2,370	4,280	.734	.82
.....	32,600	3,440	10,800	1.85	2.13
1906.					
.....	21,500	4,380	9,590	1.64	1.89
.....	6,930	2,370	3,710	.636	.66
.....	65,400	3,670	14,300	2.45	2.82
.....	52,600	3,900	12,100	2.08	2.32
.....	5,360	1,560	2,990	.513	.59
.....	3,440	1,180	1,980	.340	.38
.....	5,360	1,560	2,720	.467	.54
.....	8,070	1,370	4,380	.751	.87
.....	3,670	1,180	1,920	.329	.37
.....	5,870	2,580	3,760	.645	.74
.....	21,700	2,160	5,270	.904	1.01
.....	23,800	3,220	10,600	1.82	2.10
ear.....	65,400	1,180	6,110	1.05	14.29

or February, 1906, probably somewhat in excess of the true values, since no correction was e effect of ice conditions. The measurement made February 12, 1906, indicated that on that was 10 per cent less than the flow as given by the open-channel rating.
alues for 1905 and 1906 are excellent, except those for February, 1906, which is good.

LICKING RIVER AT PLEASANT VALLEY, OHIO.

station was established November 14, 1902, and was discon- uly 21, 1906. It is located at the highway bridge 300 feet the railroad station at Pleasant Valley, Ohio, and 9 miles st of Zanesville, Ohio. The conditions at this station and h marks are described in Water-Supply Paper No. 169, page e are given also references to publications that contain data ious years. The records at this point are especially valuable Licking River is a source of possible water supply for le.

e measurements of Licking River at Pleasant Valley, Ohio, in 1905 and 1906.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
...	R. W. Pratt	95	499	1.70	1,340
...	do	122	647	6.00	1,730
...	do	80	355	3.13	447
...	M. S. Brennan	79	337	2.86	502
...	S. K. Clapp	80	317	2.40	391
...	do	70	255	1.92	347
...	R. W. Pratt	65	242	1.58	114
...	do	67	241	2.33	241
4 ...	do	69	284	2.32	318
...	E. F. Kriegsman	79	405	4.05	906
...	do	97	482	3.63	919

Daily gage height, in feet, of Licking River at Pleasant Valley, Ohio, for 190—

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	2.8	2.6	2.3	9.0	2.5	2.1
2	2.5	2.6	2.3	6.8	2.5	2.6
3	2.6	2.5	2.5	5.2	2.7	2.3
4	10.8	2.5	6.5	4.6	2.6	2.1
5	8.8	2.5	4.6	4.1	2.5	2.0
6	6.7	3.3	3.4	4.5	2.4	2.1
7	4.9	2.7	3.2	4.2	2.3	2.0
8	4.0	2.6	3.1	3.8	2.3	2.0
9	3.6	2.6	3.1	3.6	2.6	1.9
10	3.3	2.6	3.0	3.8	2.4	1.9
11	3.1	.....	2.9	3.7	2.3	1.8
12	2.8	.....	2.8	3.4	2.2	1.8
13	2.6	.....	2.7	3.2	2.2	1.8
14	2.9	.....	2.7	3.1	2.1	1.9
15	4.4	.....	2.6	4.1	2.1	1.9
16	8.8	.....	2.6	3.8	2.1	1.8
17	5.9	.....	2.5	3.4	2.1	2.4
18	5.0	2.4	2.6	3.1	2.1	2.2
19	4.4	2.3	2.7	3.0	2.1	2.3
20	3.9	2.3	2.5	2.9	2.0	2.2
21	3.7	2.2	3.0	2.8	2.0	2.2
22	3.5	3.8	3.6	2.7	2.0	2.1
23	3.6	3.3	3.1	2.6	1.9	2.3
24	3.4	3.1	2.7	2.6	1.9	2.1
25	3.1	3.0	2.8	2.5	1.9	1.9
26	2.9	2.9	2.8	2.8	1.9	1.9
27	2.8	2.9	10.3	3.1	1.9	1.8
28	2.7	2.6	16.0	2.8	2.3	5.9
29	2.7	.....	10.2	2.7	2.6	3.1
30	2.6	.....	7.8	2.6	2.4	2.4
31	2.6	.....	10.8	.....	2.2	.....

NOTE.—Ice conditions February 5 to 20; ice attained a thickness of about 0.5 foot.

Rating tables for Licking River at Pleasant Valley, Ohio.

JANUARY 1, 1905, TO MAY 12, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	54	2.20	230	2.90	470	3.60	760
1.50	66	2.30	260	3.00	510	3.70	810
1.60	81	2.40	290	3.10	550	3.80	860
1.70	99	2.50	320	3.20	590	3.90	910
1.80	120	2.60	350	3.30	630	4.00	960
1.90	143	2.70	390	3.40	670	4.20	1,080
2.00	170	2.80	430	3.50	710	4.40	1,200
2.10	200						

[a] This table is applicable only for open-channel conditions. It is based on discharge measure made during 1904 and 1905. It is not well defined. Above gage height 4.4 feet the following rating should be used.

MAY 13, 1905, TO JULY 21, 1906.[a]

1.40	80	2.30	310	3.20	640	4.20	1,110
1.50	100	2.40	340	3.30	680	4.40	1,210
1.60	120	2.50	370	3.40	720	4.60	1,320
1.70	140	2.60	400	3.50	760	4.80	1,440
1.80	165	2.70	440	3.60	810	5.00	1,560
1.90	190	2.80	480	3.70	860	5.20	1,700
2.00	220	2.90	520	3.80	910	5.40	1,840
2.10	250	3.00	560	3.90	960		
2.20	280	3.10	600	4.00	1,010		

[a] This table is applicable only for open-channel conditions. It is based on discharge measure made during 1905. Above gage height 5.0 feet the rating curve is a tangent, the difference being *tenth*. All determinations of discharge based on this and the preceding rating table are subject t *errors over* periods varying from a few days to several months. This is due to changes in condit *flow during* both high and low stages.

ly discharge of Licking River at Pleasant Valley, Ohio, for 1905 and 1906.

[Drainage area, 696 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
.....	1,440	50	368	0.529	0.61
.....	2,400	50	482	.693	.72
.....	5,410	320	1,200	1.72	1.98
.....	1,910	170	370	.532	.59
.....	5,550	170	987	1.42	1.64
.....	2,540	165	595	.855	.95
.....	720	80	168	.241	.28
.....	2,890	80	357	.513	.59
.....	1,770	80	285	.409	.46
.....	3,800	120	600	.862	.99
.....	2,330	190	549	.789	.88
.....	5,200	310	1,020	1.47	1.70
r.....	5,550	50	580	.836	11.39
1906.					
.....	5,620	370	1,210	1.74	2.01
.....	910	200	348	.500	.52
.....	9,260	310	1,440	2.07	2.39
.....	4,360	370	931	1.34	1.50
.....	440	190	289	.415	.48
.....	2,190	165	317	.455	.51
.....	760	165	290	.417	.33

a Ice conditions January 4–March 2, 1905.

ues for 1905 and 1906 have been corrected for ice conditions during frozen periods. Values 906 are fair. For relatively short periods the values are frequently only approximate ging conditions of flow.

KANAWHA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

ha River, which rises in Watauga, Ashe, and Alleghany N. C., flows northwestward through Virginia and West Vir- joins Ohio River at Point Pleasant, W. Va. In its upper is known as New River. The headwaters lie in the Appala- ountains, among the high ridges which form the divides the drainage basin of this river and Yadkin River on the east ton River on the west. The upper tributaries drain narrow the mountainous region of North Carolina, and their slopes ally steep and their beds rough. The main river cuts the y Front just below Pearisburg, Va.; thence the river's course h a narrow valley of West Virginia over a rough bed with ls and rapids. The basin is as beautiful and picturesque as e eastern part of the United States. The country on its urses, through which the Chesapeake and Ohio Railway noted for its scenic beauty. Below the junction with the e river is known as the Kanawha.

incipal tributaries of New River are Little River, which ear Radford, Va., and Greenbrier River, which rises in the art of West Virginia and joins New River at Hinton, W. Va.

NEW RIVER AT RADFORD, VA.

This station was established August 1, 1898, and was discontinue July 15, 1906. It is located at the highway bridge near the Norfol and Western Railway station. The conditions at this station and tl bench marks are described in Water-Supply Paper No. 169, page 5 where are given also references to publications that contain da for previous years. The length of the chain is now 86.95 feet. T following discharge measurement was made June 11, 1906:

Width, 568 feet; area, 1,690 square feet; gage height, 3.6 feet; discharge, 1,(second-feet.

Daily gage height, in feet, of New River at Radford, Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Jul
1	4.0	5.1	4.0	6.2	3.9	3.7	
2	3.9	4.9	4.1	5.3	3.9	3.7	
3	4.1	4.9	4.2	4.9	3.8	3.8	
4	6.9	4.5	4.8	4.7	4.2	3.7	
5	6.1	4.3	4.9	4.4	4.1	3.7	
6	5.7	4.7	4.7	4.1	4.5	3.8	
7	5.4	4.5	4.4	4.1	4.6	3.7	
8	4.5	4.3	4.5	4.4	4.3	3.7	
9	4.3	4.4	4.3	4.3	4.3	3.8	
10	4.2	4.3	4.2	4.4	4.1	3.7	
11	3.7	4.2	4.1	4.3	4.0	3.6	
12	3.6	4.2	4.0	4.3	4.0	3.6	
13	4.3	3.8	4.1	4.3	4.0	3.9	
14	4.9	3.7	4.2	4.1	3.8	5.85	
15	4.7	3.8	4.2	4.2	3.8	6.0	
16	4.8	3.7	5.4	4.3	3.9	5.2	.....
17	4.7	3.7	5.6	5.2	3.7	5.0	.....
18	4.5	3.8	4.7	4.8	3.7	4.9	.....
19	4.5	3.7	4.4	4.6	3.8	4.8	.....
20	4.2	4.0	4.5	4.4	3.7	4.6	.....
21	4.2	4.1	5.0	4.3	3.7	4.9	.....
22	4.2	3.9	4.4	4.2	3.8	4.3	.....
23	8.2	4.2	4.5	4.1	3.7	4.0	.....
24	10.3	4.3	4.4	4.0	3.7	4.0	.....
25	7.1	4.1	4.4	4.1	3.8	4.0	.....
26	6.6	4.0	4.4	3.7	3.7	3.8	.....
27	5.9	4.1	4.4	3.9	3.7	3.8	.....
28	6.0	4.0	4.8	3.8	4.0	3.8	.....
29	5.5	.....	4.7	3.8	3.9	3.8	.....
30	5.4	.....	4.4	3.8	3.9	3.7	.....
31	5.2	.....	6.8	.....	3.8	.....	.....

NOTE.—Discharge not affected by ice conditions during 1906.

Rating table for New River at Radford, Va., for 1898 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.60	2,160	4.90	6,380	6.20	11,610	8.00	19,920
3.70	2,430	5.00	6,770	6.30	12,040	8.20	20,990
3.80	2,710	5.10	7,160	6.40	12,470	8.40	22,100
3.90	3,000	5.20	7,550	6.50	12,900	8.60	23,250
4.00	3,290	5.30	7,940	6.60	13,340	8.80	24,440
4.10	3,590	5.40	8,340	6.70	13,780	9.00	25,650
4.20	3,900	5.50	8,740	6.80	14,230	9.20	26,870
4.30	4,220	5.60	9,140	6.90	14,680	9.40	28,100
4.40	4,550	5.70	9,540	7.00	15,130	9.60	29,340
4.50	4,900	5.80	9,950	7.20	16,030	9.80	30,580
4.60	5,260	5.90	10,360	7.40	16,950	10.00	31,820
4.70	5,630	6.00	10,770	7.60	17,900	10.30	33,720
4.80	6,000	6.10	11,190	7.80	18,890		

TE.—The above table is applicable only for open-channel conditions. It is based on 7 discharge urements made June 27, 1900, August 8, 1901, and in 1904–5. It is well defined between gage heights t and 7.5 feet. Above gage height 7.5 feet the rating table is based on the extension of the area velocity curves and is only approximate.

Monthly discharge of New River at Radford, Va., for 1906.

[Drainage area, 2,720 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ary	33,700	2,160	8,070	2.97	3.42
uary	7,160	2,430	3,930	1.44	1.50
h	14,200	3,290	5,230	1.92	2.21
l	11,600	2,430	4,550	1.67	1.86
	5,260	2,430	3,100	1.14	1.31
	10,800	2,160	3,970	1.46	1.63
	2,710	2,160	2,310	.849	.47

TE.—Values for 1906 are excellent.

GREENBRIER RIVER AT ALDERSON, W. VA.

The gaging station was established August 1, 1895, and was distinued July 15, 1906. It is located at the highway bridge one-half le above the mouth of Muddy Creek, in the village of Alderson, Va., 21 miles above Hinton. The conditions at this station and bench marks are described in Water-Supply Paper No. 169, page , where are given also references to publications that contain data previous years.

The following discharge measurement was made June 13, 190

Width, 325 feet; area, 475 square feet; gage height, 2.30 feet; discharge, 602 sec feet.

Daily gage height, in feet, of Greenbrier River at Alderson, W. Va., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.
1	2.9	3.2	2.3	5.1	2.9	2.6	17	3.8	2.1	5.5	4.9	2.7
2	2.8	3.0	2.25	4.8	2.8	2.6	18	3.6	2.0	4.22	3.7	2.8
3	4.45	2.8	2.25	4.2	2.75	2.55	19	3.45	2.0	3.7	3.55	2.8
4	7.5	2.65	4.15	3.7	3.0	2.55	20	3.3	2.1	4.1	3.4	2.75
5	6.5	2.55	4.8	3.5	3.35	2.55	21	3.15	2.15	4.2	3.2	2.7
6	4.8	2.6	3.8	3.5	3.3	2.55	22	3.0	2.25	4.0	3.1	2.7
7	3.9	2.55	3.3	3.2	3.2	2.55	23	9.3	2.85	4.1	3.05	2.65
8	3.5	2.45	3.1	4.0	3.2	3.0	24	8.8	2.7	4.05	2.9	2.65
9	3.3	2.4	3.05	3.8	3.2	3.0	25	5.5	2.6	4.0	2.8	2.6
10	3.05	2.45	3.0	3.1	3.1	2.6	26	4.5	2.5	4.5	2.75	2.5
11	2.65	2.4	2.6	4.6	3.0	2.55	27	3.8	2.45	5.1	2.75	2.5
12	3.0	2.35	2.6	4.1	2.9	2.55	28	3.9	2.4	7.0	3.8	2.5
13	2.9	2.3	2.55	3.7	2.7	2.5	29	3.9	.....	6.6	3.25	2.55
14	4.1	2.3	2.6	3.4	2.6	2.5	30	3.6	.....	6.0	3.05	2.55
15	4.1	2.3	4.9	5.32	2.5	2.5	31	3.4	.....	6.4	.....	2.6
16	3.95	2.3	7.1	5.4	2.6	2.5						

Rating table for Greenbrier River at Alderson, W. Va., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	340	3.30	2,408	4.60	5,595	6.80	12,425
2.10	431	3.40	2,680	4.70	5,861	7.00	13,140
2.20	537	3.50	2,897	4.80	6,130	7.20	13,860
2.30	659	3.60	3,119	4.90	6,403	7.40	14,600
2.40	798	3.70	3,346	5.00	6,680	7.60	15,350
2.50	954	3.80	3,579	5.20	7,243	7.80	16,120
2.60	1,124	3.90	3,818	5.40	7,818	8.00	16,910
2.70	1,301	4.00	4,062	5.60	8,412	8.20	17,710
2.80	1,483	4.10	4,310	5.80	9,031	8.40	18,510
2.90	1,670	4.20	4,561	6.00	9,675	8.60	19,330
3.00	1,862	4.3	4,815	6.20	10,340	8.80	20,170
3.10	2,059	4.40	5,072	6.40	11,025	9.00	21,030
3.20	2,261	4.50	5,332	6.60	11,725	9.20	22,350

NOTE.—The above table is applicable only for open-channel conditions. It is based on 10 disc measurements made during 1903–1905 between gage heights 1.4 feet and 8 feet. It is well defined bet these limits.

Monthly discharge of Greenbrier River at Alderson, W. Va., for 1906.

[Drainage area, 1,330 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep incl
January	22,300	1,210	5,110	3.81	
February	2,260	340	928	.693	
March	13,500	598	4,770	3.56	
April	7,820	1,390	3,520	2.63	
May	2,570	954	1,490	1.11	
June	2,900	431	1,180	.881	

NOTE.—Values for 1906 are probably excellent.

SCIOTO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

River rises in the eastern part of Auglaize County, Ohio, stward for about 40 miles and then almost due south, enter- Ohio at Portsmouth. Below Columbus, where it is joined by itangy, it is one of the largest and most important streams in e. The United States Geological Survey maintains stations Scioto and Olentangy rivers at Columbus for the purpose of the water supply and sewage disposal of that city. The s considerable fall and flows through a hilly basin, forming is good locations for water-power developments.

SCIOTO RIVER NEAR COLUMBUS, OHIO.

tation was originally established for the Ohio State board of to obtain data for the water-supply and sewage-disposal s of Columbus. It was located on the Grand View Avenue 3 miles northwest of Columbus post-office, and was reestab- n the same bridge for the United States Geological Survey on er 21, 1903. The station was discontinued July 21, 1906. ditions at this station and the bench marks are described in upply Paper No. 169, page 60, where are given also refer- publications that contain data for previous years.

ily gage height, in feet, of Scioto River near Columbus, Ohio, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
	10.6	10.41	10.08	16.7	10.4	9.63	9.3
	10.6	9.96	11.7	15.56	10.3	10.1	9.31
	10.5	10.06	11.8	14.7	10.15	9.8	9.25
	12.75	10.06	12.2	13.6	10.06	10.45	9.2
	13.3	9.99	11.7	12.7	10.05	9.53	9.7
	12.64	9.9	10.7	11.48	10.02	9.45	9.52
	12.3	9.89	10.73	11.75	9.99	9.15	12.3
	11.5	10.02	10.53	11.7	9.9	9.1	10.98
	11.4	9.9	10.72	11.6	9.91	9.3	10.72
	10.5	9.8	10.77	11.48	9.8	10.2	10.19
	10.49	9.72	10.75	11.22	9.7	10.0	10.52
	10.6	9.73	10.55	11.09	9.7	9.7	9.99
	10.36	9.73	10.5	10.89	9.69	9.6	9.52
	10.43	9.98	10.45	10.7	9.7	9.6	9.6
	9.84	9.89	10.32	12.12	9.7	9.46	9.53
	12.9	9.78	10.3	11.8	9.72	9.4	9.6
	13.8	9.82	10.29	11.48	9.7	9.37	9.54
	12.59	9.9	10.29	10.02	9.6	9.4	9.5
	12.25	9.82	10.41	10.76	9.59	9.35	9.51
	11.49	9.9	9.91	10.7	9.55	9.89	9.48
	11.4	9.54	10.05	10.32	9.5	9.77	9.46
	11.7	10.09	10.25	10.48	9.48	9.59	.....
	12.78	10.3	10.09	10.3	9.98	9.6	.....
	12.57	10.7	10.25	10.4	9.7	9.71	.....
	11.65	10.0	10.31	10.19	9.5	9.82	.....
	11.0	10.86	10.61	10.27	9.5	9.8	.....
	10.9	10.7	21.1	10.51	9.48	9.7	.....
	10.76	10.3	20.36	11.26	9.7	9.62	.....
	10.76	.....	17.37	10.9	9.69	9.51	.....
	10.53	.....	18.5	10.56	9.7	9.37	.....
	10.5	.....	18.2	.....	9.64	.....	.....

Rating table for Scioto River near Columbus, Ohio, for 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
9.10	43	10.40	475	11.70	1,340	14.00	3,595
9.20	61	10.50	530	11.80	1,420	14.20	3,825
9.30	81	10.60	585	11.90	1,500	14.40	4,065
9.40	103	10.70	645	12.00	1,585	14.60	4,305
9.50	128	10.80	705	12.20	1,755	14.80	4,555
9.60	156	10.90	765	12.40	1,935	15.00	4,805
9.70	186	11.00	830	12.60	2,120	16.00	6,100
9.80	218	11.10	895	12.80	2,310	17.00	7,640
9.90	253	11.20	965	13.00	2,510	18.00	9,200
10.00	291	11.30	1,035	13.20	2,715	19.00	10,850
10.10	332	11.40	1,110	13.40	2,925	20.00	12,600
10.20	376	11.50	1,185	13.60	3,145	21.00	14,450
10.30	424	11.60	1,260	13.80	3,365		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 17 discharge measurements made during 1904–5. It is well defined between gage heights 9 feet and 12 feet. The table above 12 feet is based on 4 measurements from 18 to 23 feet gage height.

Monthly discharge of Scioto River near Columbus, Ohio, for 1906.

[Drainage area, 1,050 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	2,820	232	1,240	1.18	1.36
February	741	139	317	.302	.31
March	14,600	268	2,330	2.22	2.56
April	7,190	372	1,450	1.38	1.54
May	475	123	218	.208	.24
June	502	43	176	.168	.19
July 1-21	1,840	61	302	.288	.22

NOTE.—Values for 1906 are probably excellent. This estimate of accuracy is dependent on continuance of the conditions of flow in 1905, as no measurements have been made in 1906. The value for February may also be slightly in error, due to ice conditions.

OLENTANGY RIVER NEAR COLUMBUS, OHIO.

This station was established October 7, 1903, in connection with the water-supply and sewage-disposal investigations of the city of Columbus, Ohio. It is located 4 miles north of the Columbus post-office and one-fourth mile west of North High street, at the Dodridge Street Bridge. This station was discontinued July 23, 1906. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 64, where are given also references to publications that contain data for previous years.

Gage heights for 1906 are considered very unreliable and hence are not published. The following discharge measurements were made during 1906:

Discharge measurements of Olentangy River near Columbus, Ohio, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 13[a]	Brennan and Kriegsman	135	397	6.77	[illegible]
March 4	E. F. Kriegsman	151	832	8.84	1,340
April 7	do	142	658	7.84	598
May 16	do	138	493	6.86	190

[a] River entirely frozen over. Average thickness of ice, 0.6 foot; ice smooth underneath. Gage height is to water surface, which was about 0.05 foot below the ice surface.

LITTLE MIAMI RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

ittle Miami River rises in the southeastern part of Clark County, s southwest through Greene and Warren counties, and enters Ohio er just above Cincinnati. The greater part of the drainage area to the east, as there is only a narrow piece of country between this Miami River. The Little Miami is the best power river in the e of Ohio, and the data collected in this basin are of value in that nection and also in connection with sewage and other waste dis- l at Springfield.

LITTLE MIAMI RIVER AT LOVELAND, OHIO.

his station was established May 19, 1906, and discontinued July 1906. It is located at the Main Street Bridge in Loveland, Ohio, ut 800 feet above the Baltimore and Ohio Railroad bridge in er to furnish data for water-power estimates and for study of hods of disposing of waste products.

he channel is practically straight for 900 feet above and below the ion and bends sharply to the right about 900 feet below. Both ks are high and do not overflow. The bed is a rock ledge covered n a thin layer of sand. The velocity is medium. Measurements y be affected by the ruins of an old dam about 1,300 feet below the ion.

Discharge measurements are made from the upstream side of the -span highway bridge to which the gage is attached. The initial nt for soundings is the face of the right abutment. A standard in gage is fastened to the band rail of the bridge; length of chain, 00 feet. The gage was read by Stewart Williams. The gage is erred to a standard United States Geological Survey bench mark bedded in the top of the right abutment of the upstream side of the lge, and stamped "584 Columbus datum," elevation 23.19, above gage datum.

Discharge measurements of Little Miami River at Loveland, Ohio, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
12	E. F. Kriegsman	291	942	4.30	995
21	do	282	672	3.40	344
8	do	276	661	3.37	324

Daily gage height, in feet, of Little Miami River at Loveland, Ohio.

Day.	May.	June.	July.	Day.	May.	June.	July.
1		3.32	2.85	17		3.0	4.15
2		3.12	2.9	18		3.28	3.6
3		2.95	2.9	19	3.3	3.2	3.3
4		3.18	3.35	20	3.15	3.12	4.0
5		3.4	3.58	21	3.25	3.05	
6		4.6	3.4	22	3.25	3.12	
7		3.6	3.3	23	3.88	3.0	
8		3.28	4.15	24	3.58	2.9	
9		3.12	3.92	25	3.45	3.32	
10		2.95	3.52	26	3.3	3.05	
11		3.15	3.42	27	3.28	3.18	
12		3.05	3.35	28	4.25	3.08	
13		3.02	3.3	29	3.52	3.15	
14		3.12	3.18	30	3.4	2.98	
15		3.28	2.98	31	3.42		
16		3.22	3.22				

MAD RIVER NEAR SPRINGFIELD, OHIO.

This station was established December 31, 1903, and discontinued March 31, 1906. It is located at the highway bridge 4 miles west of Springfield, Ohio, about 500 feet below the old Red Mill dam. The conditions at this station and the bench marks are decribed in Water-Supply Paper No. 169, page 67, where are given also references to publications that contain data for previous years.

Discharge measurements of Mad River near Springfield, Ohio, in 1904 and 1905.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. feet.*	*Feet.*	*Sec.-ft.*
January 30	R. W. Pratt	55	224	6.40	334
February 27	do	60	292	6.60	567
March 25	do	99	701	10.20	2,580
April 9	do	63	337	6.90	830
June 25	do	65	239	5.82	282
July 30 [a]	do	82	80	5.65	174
August 30 [a]	do	97	92	5.56	138
September 23 [a]	do	96	95	5.50	127
October 18 [a]	do	95	99	5.59	145
November 17 [a]	do	96	117	5.64	130
December 28 [a]	do	130	939	6.50	467
1905.					
January 12 [a]	R. W. Pratt	165	926	6.63	557
February 27 [a]	do	125	935	6.97	730
March 23 [a]	do	108	830	6.13	326
May 20	M. S. Brennan	117	430	6.64	818
June 18	Sidney K. Clapp	113	350	6.00	341
July 11	do	111	330	5.92	279
August 24 [a]	R. W. Pratt	103	699	5.86	334
August 24	do	111	321	5.87	329
October 11 [a]	do	105	744	6.18	351
November 11 [a]	do	105	702	6.15	300
1906.					
March 3	E. F. Kriegsman	115	524	7.42	1,430

[a] Made at different sections.

Daily gage height, in feet, of Mad River near Springfield, Ohio, for 1906.

Day.	March.	Day.	March.
	6.0	17	6.1
	5.9	18	6.0
	7.7	19	6.0
	6.7	20	6.0
	6.5	21	6.1
	6.3	22	6.1
	6.2	23	6.2
	6.3	24	6.1
	6.3	25	6.2
	6.3	26	7.0
	6.3	27	15.0
	6.3	28	11.3
	6.2	29	9.6
	6.2	30	11.0
	6.2	31	10.5
	6.1		

ng table for Mad River near Springfield, Ohio, applicable February 7 to March 27 d July 14 to October 31, 1904; January 13 to February 3, February 22 to May 12, d July 1 to October 16, 1905.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
5.20	35	6.10	345	7.00	740	8.80	1,710
5.30	60	6.20	385	7.20	840	9.00	1,830
5.40	90	6.30	425	7.40	940	10.00	2,440
5.50	123	6.40	465	7.60	1,040	11.00	3,090
5.60	157	6.50	505	7.80	1,145	12.00	3,790
5.70	192	6.60	550	8.00	1,255	13.00	4,515
5.80	228	6.70	595	8.20	1,365	14.00	5,265
5.90	266	6.80	640	8.40	1,475	15.00	6,015
6.00	305	6.90	690	8.60	1,590		

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1904 and 1905. It is based on an average curve, and is applied directly over eriods indicated above. During periods when discharge measurements do not plot fairly close e curve it has been used as a basis for determining the daily discharge by the indirect method for ing conditions of flow. Below gage height 5.4 feet the curve is only approximate.

Discharge measurements of Miami River at Dayton, Ohio, in 1905 and 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charg
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-f*
March 18	R. W. Pratt	406	1,600	2.15	1.
May 19	M. S. Brennan	443	1,880	3.53	4.
June 17	Sidney K. Clapp	373	1,090	1.60	
July 11	do	359	897	1.10	
August 25	R. W. Pratt	382	1,630	2.45	1.
October 12	do	377	1,260	1.55	
November 18	do	385	1,200	1.48	
1906.					
March 3	E. F. Kriegsman	377	1,540	2.35	1.
April 6	do	348	1,880	3.70	4.
April 11	do	382	1,550	3.07	3.
June 4	Murphy and Kriegsman	219	1,600	1.25	

Daily gage height, in feet, of Miami River at Dayton, Ohio, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Se
1	2.3	2.2	1.5	7.8	1.8	1.2	1.0	1.4	
2	2.1	2.2	1.5	6.8	1.7	1.2	1.0	1.3	
3	3.3	2.2	2.2	5.5	1.7	1.2	1.3	1.1	
4	5.2	2.3	2.5	8.5	1.6	1.1	1.1	1.0	
5	5.1	2.5	2.4	3.7	1.6	1.1	1.0	1.0	
6	3.9	.....	2.3	3.7	1.6	1.2	0.9	0.9	
7	3.0	.....	1.5	3.5	1.5	1.2	1.0	.7	
8	2.8	.....	1.9	3.2	1.5	1.0	3.0	1.0	
9	3.0	.....	1.9	3.0	1.5	1.0	2.0	3.0	
10	3.0	.....	2.0	3.4	1.5	1.0	2.0	2.9	
11	3.0	.....	2.0	3.2	1.4	1.0	2.2	2.2	
12	3.0	.....	1.9	2.9	1.4	0.9	1.5	1.6	
13	3.3	.....	1.9	2.7	1.3	.9	1.2	1.2	
14	2.8	.....	1.9	2.5	1.3	.9	1.1	1.3	
15	2.4	1.8	1.8	2.5	1.2	1.0	1.5	1.2	
16	5.3	2.0	1.8	2.5	1.2	1.0	1.6	1.1	
17	5.0	1.9	1.8	2.5	1.1	1.0	1.7	1.0	
18	3.7	1.8	1.8	2.4	1.1	1.1	1.8	1.5	
19	3.2	1.8	1.7	2.3	1.1	1.1	1.9	1.3	
20	3.0	1.9	1.6	2.2	1.2	1.0	2.0	1.6	
21	2.9	1.9	1.7	2.1	1.2	1.0	2.4	2.0	
22	3.0	2.0	1.8	2.0	1.1	1.0	1.0	2.0	
23	4.0	2.0	1.7	2.0	1.4	1.0	1.0	2.0	
24	3.5	2.0	1.8	2.0	1.3	0.9	1.2	1.9	
25	3.0	1.9	1.8	1.9	1.1	.9	1.1	1.8	
26	2.7	1.8	1.7	1.9	1.0	.8	1.0	1.4	
27	2.5	1.8	10.0	1.9	1.2	.8	1.0	2.0	
28	2.3	1.8	11.9	1.8	1.3	.8	1.2	2.4	
29	2.3	.....	8.0	1.8	1.3	.7	2.5	2.0	
30	2.3	.....	7.4	1.7	1.3	.7	2.0	1.7	
31	2.3	.....	8.7	.....	1.3	.....	1.4	1.5	.....

NOTE.—River frozen February 5 to 14.

but 20 or 30 feet high. Below Dayton the Miami and some of its tributaries occupy pre-Glacial lines which are only partly filled with glacial deposits. The work of the present streams has been in the main a reexcavation of the valleys. In this work they have fallen far short of reaching the old rock floors that lie 100 to 200 feet below their beds. The depth of this reexcavation is but 50 to 100 feet, and the width is but a small fraction of that of the old valley, seldom so much as one-fourth as great. The contrast between the southern and the northern portion of this drainage basin, therefore, is not found in the work of the present streams, but is due to the less complete concealment of pre-Glacial drainage lines.

The fall of the Miami is rapid throughout its entire length, being seldom less than 3 feet and usually over 4 feet per mile. The streams in this drainage system seldom reach a very low stage in seasons of drought, for the valleys are usually filled with gravelly or sandy deposits which furnish strong springs. Even in the small tributaries water-bearing beds outcrop along the banks or bluffs.

This stream and several of its tributaries afford valuable water power, the utilization of which is discussed by Prof. Dwight Porter in the Tenth Census Report.[a] From this report it appears that a total of 9,431 horsepower was used in 1880 by 290 mills, manufactories, etc., on the Miami and its tributaries, including Whitewater River.

The following pages contain the results of stream measurement data collected by the United States Geological Survey in the drainage basin of Miami River:

MIAMI RIVER AT DAYTON, OHIO.

This station was established March 18, 1905. It is located at the Miami Street Bridge, Dayton, Ohio, about one-half mile below the mouth of Mad River. There is a dam 1 mile above the station which may divert water through a canal and discharge it 1,000 feet below the gaging section. There is also a dam on Mad River, 2½ miles above the station, where water is diverted into the Miami canal. Besides water power the data at this station are valuable for water supply and sewage disposal. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 69. The gage heights are furnished by the United States Weather Bureau.

[a] Tenth Census of United States, 1880, Vol. XVII, pp. 478-487.

Discharge measurements of Miami River at Dayton, Ohio, in 1905 and 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Di char
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.*
March 18	R. W. Pratt	406	1,600	2.15	1
May 19	M. S. Brennan	443	1,880	3.53	4
June 17	Sidney K. Clapp	373	1,090	1.60	
July 11	do	359	897	1.10	
August 25	R. W. Pratt	382	1,630	2.45	1
October 12	do	377	1,260	1.55	
November 18	do	385	1,200	1.48	
1906.					
March 3	E. F. Kriegsman	377	1,540	2.35	1
April 6	do	348	1,880	3.70	4
April 11	do	382	1,550	3.07	3
June 4	Murphy and Kriegsman	219	1,600	1.25	

Daily gage height, in feet, of Miami River at Dayton, Ohio, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Se
1	2.3	2.2	1.5	7.8	1.8	1.2	1.0	1.4	
2	2.1	2.2	1.5	6.8	1.7	1.2	1.0	1.3	
3	3.3	2.2	2.2	5.5	1.7	1.2	1.3	1.1	
4	5.2	2.3	2.5	8.5	1.6	1.1	1.1	1.0	
5	5.1	2.5	2.4	3.7	1.6	1.1	1.0	1.0	
6	3.9	.....	2.3	3.7	1.6	1.2	0.9	0.9	
7	3.0	.....	1.5	3.5	1.5	1.2	1.0	.7	
8	2.8	.....	1.9	3.2	1.5	1.0	3.0	1.0	
9	3.0	.....	1.9	3.0	1.5	1.0	2.0	3.0	
10	3.0	.....	2.0	3.4	1.5	1.0	2.0	2.9	
11	3.0	.....	2.0	3.2	1.4	1.0	2.2	2.2	
12	3.0	.....	1.9	2.9	1.4	0.9	1.5	1.6	
13	3.3	.....	1.9	2.7	1.3	.9	1.2	1.2	
14	2.8	.....	1.9	2.5	1.3	.9	1.1	1.3	
15	2.4	1.8	1.8	2.5	1.2	1.0	1.5	1.2	
16	5.3	2.0	1.8	2.5	1.2	1.0	1.6	1.1	
17	5.0	1.9	1.8	2.5	1.1	1.0	1.7	1.0	
18	3.7	1.8	1.8	2.4	1.1	1.1	1.8	1.5	
19	3.2	1.8	1.7	2.3	1.1	1.1	1.9	1.3	
20	3.0	1.9	1.6	2.2	1.2	1.0	2.0	1.6	
21	2.9	1.9	1.7	2.1	1.2	1.0	2.4	2.0	
22	3.0	2.0	1.8	2.0	1.1	1.0	1.0	2.0	
23	4.0	2.0	1.7	2.0	1.4	1.0	1.0	2.0	
24	3.5	2.0	1.8	2.0	1.3	0.9	1.2	1.9	
25	3.0	1.9	1.8	1.9	1.1	.9	1.1	1.8	
26	2.7	1.8	1.7	1.9	1.0	.8	1.0	1.4	
27	2.5	1.8	10.0	1.9	1.2	.8	1.0	2.0	
28	2.3	1.8	11.9	1.8	1.3	.8	1.2	2.4	
29	2.3	.....	8.0	1.8	1.3	.7	2.5	2.0	
30	2.3	.....	7.4	1.7	1.3	.7	2.0	1.7	
31	2.3	.....	8.7	.....	1.3	.....	1.4	1.5	.....

NOTE.—River frozen February 5 to 14.

Rating table for Miami River at Dayton, Ohio, for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.50	220	1.80	1,160	3.10	3,250	4.80	8,300
0.60	260	1.90	1,260	3.20	3,490	5.00	9,000
0.70	310	2.00	1,370	3.30	3,740	5.20	9,720
0.80	360	2.10	1,490	3.40	4,000	5.40	10,450
0.90	420	2.20	1,620	3.50	4,270	5.60	11,190
1.00	480	2.30	1,750	3.60	4,540	5.80	11,940
1.10	550	2.40	1,890	3.70	4,820	6.00	12,700
1.20	620	2.50	2,040	3.80	5,110	7.00	16,700
1.30	700	2.60	2,210	3.90	5,400	8.00	20,900
1.40	780	2.70	2,390	4.00	5,700	9.00	25,200
1.50	870	2.80	2,590	4.20	6,320	10.00	29,600
1.60	960	2.90	2,800	4.40	6,960	11.00	34,100
1.70	1,060	3.00	3,020	4.60	620		

OTE.—The above table is applicable only for open-channel conditions. It is based on 7 discharge surements made during 1905 and 1906. It is well defined between gage heights 1.0 feet and 4.0 feet. extension above 7.0 feet is approximate.

Monthly discharge of Miami River at Dayton, Ohio, for 1905 and 1906.

[Drainage area, 2,450 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile	Depth in inches.
1905.					
il 16-30	7,960	620	2,430	.992	.55
	26,500	620	4,720	1.93	2.22
	5,400	620	1,550	.633	.71
	1,060	310	519	.212	.24
ust	5,700	220	1,300	.531	.61
ember	9,360	420	2,860	1.17	1.30
1906.					
uary	10,100	1,490	3,810	1.56	1.80
ruary	1,750	1,000	1,240	.506	.53
ch	38,200	870	5,270	2.15	2.48
il	23,000	1,060	4,300	1.76	1.96
	1,160	480	749	.306	.35
	620	310	479	.196	.22
	3,020	420	951	.388	.45
ust	3,020	310	1,030	.420	.48
ember	550	260	342	.140	.16

OTE.—Daily discharge during frozen period estimated. Values are rated as follows: 1905, excellent, pt July, which is good; January, April, May, July, and August, 1906, excellent; February, March, e, and September, 1906, good.

KENTUCKY RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Kentucky River drains into the Ohio from the south about half-y between Cincinnati, Ohio, and Louisville, Ky. The data col-ed in this basin are valuable for water-power purposes.

KENTUCKY RIVER AT FRANKFORT, KY.

This station was established March 18, 1905, and discontinued y 21, 1906. It is located at the Government dam on the Kentucky er in the lower part of Frankfort, Ky., about 1 mile below the highway bridge. The conditions at this station and the bench rks *are described in* Water-Supply Paper No. 169, page 70.

The following discharge measurement was made April 16, 1906:

Width, 374 feet; area, 3,890 square feet; gage height, 8.12 feet; discharge, 10,800 second-feet.

Daily gage height, in feet, of Kentucky River at Frankfort, Ky., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	7.0	7.3	7.4	17.5	6.4	7.0	6.2
2	6.9	7.45	7.8	14.5	6.3	7.0	6.1
3	7.0	7.5	9.8	12.7	6.4	7.1	6.0
4	8.3	7.55	10.8	10.0	6.6	6.6	5.9
5	8.8	7.3	10.3	8.9	6.8	6.4	5.8
6	8.1	7.0	10.2	8.3	6.8	6.1	5.8
7	7.7	6.85	9.3	8.0	6.8	6.1	6.1
8	7.5	6.8	8.5	8.0	7.8	6.0	5.9
9	7.3	6.6	8.1	7.9	7.7	5.9	5.8
10	7.1	6.45	7.8	7.8	7.5	5.9	5.8
11	7.0	6.4	7.6	7.8	7.5	5.9	5.9
12	7.2	6.4	7.4	8.0	7.2	5.9	6.2
13	7.7	6.4	7.3	8.0	6.9	5.8	6.2
14	9.2	6.4	7.9	7.9	6.8	6.5	6.0
15	10.2	6.4	8.3	7.5	6.6	6.4	6.0
16	10.3	6.4	10.2	7.8	6.4	6.4	5.9
17	9.9	6.4	10.4	8.5	6.4	6.3	6.5
18	9.2	6.35	9.6	8.4	6.2	6.3	6.7
19	8.6	6.35	9.0	7.9	6.1	6.4	6.5
20	8.0	6.3	9.6	7.5	6.1	6.3	6.2
21	7.8	6.3	9.3	7.3	6.1	6.2	6.5
22	7.5	6.5	8.8	7.1	6.0	6.1	.....
23	8.0	6.9	8.4	6.95	5.9	5.9	.....
24	8.05	7.3	8.0	6.85	5.9	6.2	.....
25	7.6	8.0	8.0	6.8	5.85	6.1	.....
26	7.3	7.7	8.4	6.7	6.0	6.0	.....
27	7.1	7.5	9.4	6.5	5.9	6.0	.....
28	7.0	7.3	9.3	6.4	5.85	6.1	.....
29	6.9	.....	9.3	6.4	7.0	6.2	.....
30	6.8	.....	14.3	6.4	6.7	6.2	.....
31	6.9	.....	21.1	.....	6.4	.....	.....

SALT RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Salt River drains into the Ohio from the south about 20 to 30 miles below Louisville, Ky. The data collected in this basin are valuable for water-power purposes.

ROLLING FORK OF SALT RIVER AT NEW HAVEN, KY.

This station was established June 16, 1905, and discontinued March 31, 1906. It is located on the only two-span steel railroad bridge in New Haven, Ky., about one-fourth mile from the business section of the city. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 72.

ily gage height, in feet, of Rolling Fork of Salt River at New Haven, Ky., for 1906.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
		1.9	7.2	17	4.5	1.4	5.7
		1.7	7,7	18	3.5	1.3	4.0
	5.8	1.6	13.2	19	3.0	1.4	5.9
	7.2	1.6	16.0	20	2.7	1.2	7.2
	5.7	1.7	7.5	21		1.3	6.8
	3.7	1.5	4.7	22	11.1	1.7	4.5
	2.7	1.1	3.9	23	13.6	2.8	3.7
	2.5	1.1	3.5	24	8.3	2.5	4.2
	2.4	1.4	3.4	25	5.3		5.7
	2.0	1.2	3.6	26	3.7	2.4	5.3
	2.1	1.3	3.3	27	3.2	3.7	8.7
	2.4	1.3	2.9	28		7.3	9.0
	3.6	1.4	2.9	29	2.4		10.3
		1.6	3.5	30	2.1		17.1
	7.0	1.6	5.3	31	2.1		18.2
	4.7	1.5	8.1				

WABASH RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The drainage basin of the Wabash embraces an area of about 33,000 quare miles, distributed as follows: In Ohio, 400 square miles; in ndiana, 24,350 square miles; in Illinois, 8,250 square miles. It drains, herefore, slightly more than two-thirds of Indiana, the area of the State being 35,910 square miles. Of the portion in Indiana, about ne-half is embraced in the drainage areas of East and West White ivers. By including these drainage areas with the Wabash, the entire asin has nearly symmetrical, broadly ovate form. Not including the White River system, the Wabash basin is an unsymmetrical, elongated tract, curving around White River.

The length of the valley occupied by the Wabash is about 450 miles, but the length of the stream is fully 500 miles, for the river in its lower course makes several oxbow curves within the valley. The source of the river is about 1,000 feet above tide, while its mouth at low water is but 311 feet. The average fall, if we estimate the stream to have a ength of 500 miles, is therefore about 16.5 inches per mile. The rate of lescent is far from uniform, being much more rapid in the upper portion than in the lower. There are also many rapids, separated by pools or sluggish portions of the stream. The elevation of the stream is accurately determined at many points, but in the absence of a careful measurement of the length of the stream the rate of fall is only approximately known. The section above the point where the river enters the old lake outlet, estimated to have a length of 100 miles, has a fall of bout 300 feet, or 3 feet per mile. Railway levels and canal surveys, t the point where the river joins the old lake outlet, show its elevation to be nearly 700 feet above sea level, the altitudes reported varying between 696 and 699 feet.

The following table gives the elevation and fall at various point:

Table of altitudes and distances along Wabash River.

Location.	Estimated distance.	Altitude.	Fa r
	Miles.	*Feet.*	*In*
Source	0.0	1,000.0	
Huntington	100.0	699.0	
Mouth of Salamonie River	15.0	667.0	
Mouth of Mississinewa River	20.0	633.0	
Logansport	20.0	583.0	
Lafayette	50.0	506.0	
Attica	25.0	487.0	
Covington	20.0	470.0	
Terre Haute	55.0	447.7	
State Line	14.6	440.6	
Hutsonville, Ill	29.0	424.6	
Vincennes	46.4	398.8	
Mouth of White River	32.5	376.5	
Grayville, Ill	28.0	365.0	
Mouth of Little Wabash River	46.0	323.0	
Mouth of Wabash River	16.0	311.0	

WABASH RIVER AT LOGANSPORT, IND.

This station was established April 27, 1903, and was discontin July 21, 1906. It is located at the Cicott Street Bridge, about 1 1 from the center of the city of Logansport, Ind., 1¾ miles from Wabash Railroad station, 1½ miles from the Pennsylvania stat four blocks from the street-car line, and 1,000 feet below the mout Eel River. The conditions at this station and the bench marks described in Water-Supply Paper No. 169, page 74, where are gi also references to publications that contain data for previous ye The data collected at this station are valuable for water-power purpo

Discharge measurements of Wabash River at Logansport, Ind., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	D cha
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
February 9 [a]	Brennan and Kriegsman	486	991	2.02	
March 10	E. F. Kriegsman	499	1,390	2.78	
April 3	do	529	2,880	5.42	1
May 10	do	481	903	1.72	

[a] Ice along the edges of the river.

Daily gage height, in feet, of Wabash River at Logansport, Ind., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
.....	2.73	2.58	2.06	7.9	1.9	1.72	1.52
.....	2.57	1.4	1.88	6.85	2.4	1.66	1.55
.....	2.48	1.18	2.48	5.6	1.9	1.66	1.6
.....	2.38	1.58	3.83	4.85	1.9	1.7	1.6
.....	4.88	1.88	3.3	3.9	1.8	1.7	1.75
.....	4.43	2.03	2.93	3.8	1.8	1.72	1.87
.....	3.88	2.03	2.78	3.6	1.76	1.7	1.75
.....	3.2	2.06	2.7	4.4	1.72	1.5	1.75
.....	2.63	1.97	.....	6.7	1.76	2.7	1.69
.....	2.0	1.88	2.78	7.15	1.73	2.4	1.6
.....	2.18	1.83	2.68	5.9	1.66	2.06	1.86
.....	2.38	1.78	2.58	4.85	1.65	1.8	1.8
.....	2.18	1.83	2.53	4.8	1.6	1.86	1.83
.....	2.15	1.88	2.41	4.7	1.72	1.8	1.82
.....	2.08	2.08	2.28	5.9	1.72	1.76	1.8
.....	2.68	2.18	2.23	5.25	1.8	1.72	1.8
.....	2.88	2.23	2.18	3.8	1.68	1.7	1.8
.....	3.18	1.88	2.08	3.4	1.6	1.72	1.8
.....	3.08	1.73	1.93	3.3	1.6	1.66	1.8
.....	2.88	1.78	1.98	2.86	1.4	1.6	1.8
.....	3.88	1.78	1.98	.....	1.43	1.6	1.8
.....	8.21	1.83	2.03	2.6	1.53	1.72	1.8
.....	6.88	1.78	2.08	2.4	1.52	1.36	1.78
.....	5.88	1.88	1.88	2.3	1.56	.....	.....
.....	4.88	2.08	1.88	2.2	1.76	1.19	.....
.....	4.13	2.38	1.98	2.2	1.5	1.19	.....
.....	3.88	2.71	8.48	2.2	1.5	1.3	.....
.....	3.68	2.58	9.03	2.1	1.6	1.37	.....
.....	3.03	.....	8.38	2.15	1.44	1.4	.....
.....	2.88	.....	8.18	2.1	1.47	1.57	.....
.....	.....	.....	8.03	.....	1.84	.....	.....

TE.—Flow was not greatly affected by ice conditions.

Rating table for Wabash River at Logansport, Ind., for 1906.

Gage height	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	310	2.30	1,900	3.40	4,690	5.00	9,770
1.30	400	2.40	2,110	3.50	4,980	5.20	10,480
1.40	500	2.50	2,330	3.60	5,270	5.40	11,210
1.50	610	2.60	2,560	3.70	5,570	5.60	11,950
1.60	730	2.70	2,800	3.80	5,870	5.80	12,710
1.70	860	2.80	3,050	3.90	6,170	6.00	13,500
1.80	1,000	2.90	3,310	4.00	6,480	7.00	17,600
1.90	1,160	3.00	3,580	4.20	7,110	8.00	22,100
2.00	1,330	3.10	3,850	4.40	7,750	9.00	26,800
2.10	1,510	3.20	4,130	4.60	8,410	9.10	27,280
2.20	1,700	3.30	4,410	4.80	9,080		

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1903 to 1906. It is well defined.

Monthly discharge of Wabash River at Logansport, Ind., for 1906.

[Drainage area, 3,160 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile	Depth in inches.
ary.....	23,000	1,330	5,280	1.67	1.92
uary.....	2,820	294	1,320	.418	.44
.....	26,900	1,130	5,720	1.81	2.09
.....	21,600	1,510	7,360	2.33	2.60
.....	2,110	500	863	.273	.31
.....	2,800	302	876	.277	.31
-23.....	1,110	634	930	.294	.25

TE.—*Values for 1906 are excellent.*

WABASH RIVER AT TERRE HAUTE, IND.

This station was established February 25, 1905, and was discontinued July 20, 1906. It is located at the Vandalia Line railway bridge, near the city waterworks. There are no tributaries nor any islands, falls, or dams in the river near the station. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 77, where are given also references to publications that contain data for previous years. The data collected at this station are valuable in connection with water-power, water-supply, and sewage-disposal problems.

Discharge measurements of Wabash River at Terre Haute, Ind., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 16 [a]	Brennan and Kriegsman	482	3,790	4.40	6,710
March 28	E. F. Kriegsman	606	10,700	15.84	40,600
March 31	do	714	13,000	19.20	62,800
April 18	do	580	8,520	12.02	25,500
April 19	do	564	7,740	10.80	22,200
April 20	do	557	6,790	9.30	19,300
April 20	do	557	6,650	8.92	18,200
April 21	do	552	6,210	7.95	16,900
April 21	do	549	5,950	7.65	16,200
April 23	do	541	5,190	6.35	13,200
June 9	do	535	4,500	4.98	11,400

[a] Partial ice conditions.

Daily gage height, in feet, of Wabash River at Terre Haute, Ind., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	4.68	8.22	5.02	19.8	3.88	5.72	1.08
2	4.72	7.28	4.88	19.22	3.8	4.22	1.22
3	4.85	6.0	7.38	18.45	3.78	3.5	1.35
4	5.88	5.58	9.9	17.7	3.75	2.88	1.32
5	6.5	5.15	10.78	16.8	3.78	2.88	1.38
6	7.35	4.55	10.48	15.22	3.52	3.2	1.7
7	7.85	2.45	9.28	12.9	3.3	3.12	1.72
8	7.18	2.35	8.48	10.75	3.1	2.52	1.62
9	5.82	2.7	8.3	14.22	2.95	4.22	1.6
10	4.78	2.78	8.18	15.02	2.9	5.55	1.52
11	3.85	2.92	7.82	15.1	2.82	4.52	1.42
12	4.02	3.02	7.28	15.3	2.72	4.08	1.35
13	3.62	3.2	6.75	15.42	2.62	3.38	1.32
14	3.58	3.72	6.38	14.95	2.52	2.92	1.32
15	3.55	4.42	5.98	12.85	2.45	2.6	1.25
16	3.75	4.15	5.58	12.52	2.35	2.32	1.22
17	3.82	3.4	5.28	12.75	2.28	2.12	1.4
18	3.88	3.12	4.98	12.25	2.15	1.98	1.75
19	3.95	3.6	4.82	10.7	2.12	1.82	1.7
20	4.65	4.02	4.55	9.1	2.08	1.75	1.62
21	5.72	4.2	4.35	7.9	2.02	1.75	.....
22	13.68	3.78	4.42	6.95	1.92	1.7	.....
23	15.95	3.82	4.6	6.28	1.9	1.68	.....
24	16.82	3.78	4.52	5.72	1.85	1.6	.....
25	17.12	4.18	4.48	5.38	1.9	1.5	.....
26	17.38	5.0	6.35	5.05	1.98	1.42	.....
27	17.22	5.22	14.28	4.78	1.9	1.3	.....
28	16.25	5.3	15.88	4.48	2.12	1.28	.....
29	14.12	.....	16.42	4.25	2.08	1.2	.....
30	11.18	.....	17.02	4.05	1.88	1.15	.....
31	9.3	.....	18.95	.....	4.32	.....	.....

NOTE.—Ice gorge at railroad bridge, a short distance above the gaging section, February 7 to 18. The flow at the gaging section was probably affected by ice on only February 15 and 16.

Rating table for Wabash River at Terre Haute, Ind., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	2,050	2.50	4,510	4.00	7,620	7.00	14,700
1.10	2,180	2.60	4,700	4.20	8,060	8.00	17,200
1.20	2,320	2.70	4,900	4.40	8,500	9.00	19,800
1.30	2,460	2.80	5,100	4.60	8,940	10.00	22,500
1.40	2,610	2.90	5,300	4.80	9,380	11.00	25,300
1.50	2,770	3.00	5,500	5.00	9,830	12.00	28,400
1.60	2,940	3.10	5,700	5.20	10,300	13.00	31,800
1.70	3,110	3.20	5,900	5.40	10,780	14.00	35,500
1.80	3,280	3.30	6,100	5.60	11,260	15.00	39,500
1.90	3,450	3.40	6,310	5.80	11,740	16.00	43,700
2.00	3,620	3.50	6,520	6.00	12,220	17.00	48,100
2.10	3,790	3.60	6,740	6.20	12,700	18.00	52,700
2.20	3,970	3.70	6,960	6.40	13,200	19.00	57,400
2.30	4,150	3.80	7,180	6.60	13,700	20.00	62,100
2.40	4,330	3.90	7,400	6.80	14,200		

:E.—The above table is applicable only for open-channel conditions. It is based on discharge irements made during 1905 and 1906. It is well defined.

Monthly discharge of Wabash River at Terre Haute, Ind., for 1905 and 1906.

[Drainage area, 12,200 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
ı	39,500	7,620	16,400	1.34	1.54
	25,000	3,650	10,700	.877	.98
	48,100	7,400	19,400	1.59	1.83
	15,400	4,330	9,240	.757	.84
	9,270	2,640	5,250	.430	.50
st	5,100	2,250	3,420	.280	.32
mber	10,100	2,610	4,980	.408	.46
er	9,650	1,920	3,950	.324	.37
mber	17,200	2,640	4,840	.397	.44
nber	22,100	4,470	9,880	.810	.93
1906.					
ary	49,800	6,630	19,600	1.61	1.86
uary	17,800	4,240	8,050	.660	.69
ı	57,200	8,390	19,000	1.56	1.80
	61,200	7,730	29,500	2.42	2.70
	8,320	3,360	4,910	.402	.46
	11,500	2,250	5,010	.411	.46
1-20	3,200	2,150	2,680	.220	.16

TE.—The 1905 monthly discharge has been recomputed on the basis of the above rating table, which better results for medium and high stages.
ues for February 15 and 16, 1906, reduced on account of ice conditions on those days. Discharge g the remainder of the winter period considered unaffected by ice conditions. Values for 1905 and re excellent.

'he following table gives the horsepower (80 per cent efficiency) foot of fall that may be developed at different rates of discharge shows the number of days on which the flow and the correspond- horsepower were respectively less than the amounts given in the umns for "discharge" and "horsepower."

Discharge and horsepower table for Wabash, Terre Haute, Ind., for 1905 and 1906.

Discharge in second-feet.	Horsepower; 80 per cent efficiency per foot fall.	Number of days of deficient flow.	
		1905. [a]	1906. [b]
1,980	180	1	.....
2,200	200	6	1
2,750	250	28	18
3,300	300	57	31
3,850	350	82	45
4,400	400	101	51
4,950	450	124	59

[a] March to December.
[b] January to July 20.

NOTE.—The minimum flow during the period covered by the above table was 1,920 second-feet, giving 175 horsepower per foot of fall on one day in October, 1905.

TIPPECANOE RIVER NEAR DELPHI, IND.

This station was established March 14, 1903, and was discontinued July 20, 1906. It is located at the highway bridge at Springboro, Ind. The nearest railroad station is Delphi, 5 miles east of Springboro. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 80, where are given also references to publications that contain data for previous years. The data collected at this station are valuable for water-power purposes.

Discharge measurements of Tippecanoe River at Delphi, Ind., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 10 [a]	Brennan and Kriegsman	272	522	3.86	1,450
March 10	E. F. Kriegsman	335	790	4.74	3,320
April 3	do	325	779	4.62	3,090
May 9	do	257	361	3.27	962

[a] Slush and cake ice running.

Daily gage height, in feet, of Tippecanoe River near Delphi, Ind., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
	3.75	5.17	4.18	5.47	3.49	3.1	3.0
	3.73	4.8	4.76	5.25	3.45	3.04	3.02
	3.7	4.2	5.34	4.97	3.57	3.0	3.0
	3.72	4.16	5.27	4.63	3.51	2.99	2.99
	3.78	4.09	5.21	4.37	3.44	2.97	2.97
	3.74	4.02	4.99	4.6	3.43	3.04	2.96
	3.69	3.96	4.96	4.5	3.4	3.0	2.94
	3.66	3.93	4.89	4.42	3.33	2.95	2.9
	3.61	3.9	4.83	5.7	3.27	3.1	2.88
	3.58	3.87	4.82	5.27	3.25	3.08	2.85
	3.55	3.84	4.79	5.06	3.21	3.11	2.84
	3.52	3.81	4.76	4.89	3.19	3.32	2.87
	3.47	3.78	4.72	4.56	3.22	3.26	2.9
	3.43	3.76	4.68	4.63	3.18	3.17	2.81
	3.57	3.68	4.66	5.17	3.16	3.13	2.85
	3.51	3.64	4.59	4.95	3.15	3.1	2.98
	3.48	3.61	4.37	4.8	3.14	3.04	2.97
	3.46	3.66	4.19	4.67	3.11	3.0	2.9
	3.42	3.04	3.94	4.43	3.09	2.99	2.84
	4.73	3.6	3.88	4.37	3.08	3.0	2.82
	5.8	3.57	3.75	4.19	3.05	2.95	.....
	6.12	3.52	3.73	4.0	3.03	2.96	.....
	6.36	3.48	3.7	3.96	3.1	2.94	.....
	6.39	3.45	3.75	3.91	3.15	2.93	.....
	6.3	4.4	3.78	3.84	3.13	2.93	.....
	6.15	4.33	4.12	3.76	3.11	2.9	.....
	6.1	4.28	6.18	3.65	3.07	2.87	.....
	6.0	4.21	6.0	3.6	3.05	2.85	.....
	5.85	.....	5.94	3.57	3.03	2.95	.....
	5.57	.....	5.86	3.53	3.1	3.02	.....
	5.25	.....	5.71	.....	3.15	.....	.....

OTE.—Flow slightly affected by ice conditions February 5 to 10.

Rating table for Tippecanoe River near Delphi, Ind., for 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.80	390	3.70	1,620	4.60	3,090	5.50	4,860
2.90	510	3.80	1,770	4.70	3,270	5.60	5,070
3.00	630	3.90	1,930	4.80	3,450	5.70	5,280
3.10	760	4.00	2,090	4.90	3,640	5.80	5,490
3.20	890	4.10	2,250	5.00	3,830	5.90	5,700
3.30	1,030	4.20	2,410	5.10	4,030	6.00	5,910
3.40	1,170	4.30	2,580	5.20	4,230	6.20	6,350
3.50	1,320	4.40	2,750	5.30	4,440	6.40	6,790
3.60	1,470	4.50	2,920	5.40	4,650		

OTE.—The above table is applicable only for open-channel conditions. It is based on 28 discharge surements made during 1903 to 1906. It is well defined.

Monthly discharge of Tippecanoe River near Delphi, Ind., for 1906.

[Drainage area, 1,890 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ıary	6,770	1,200	3,100	1.64	1.89
uary	4,170	1,240	1,930	1.02	1.06
h	6,310	1,620	3,400	1.80	2.08
l	5,280	1,360	2,960	1.57	1.75
	1,420	670	916	.485	.56
	1,060	450	663	.351	.39
1-20	660	400	528	.279	.21

OTE.—Correction made in daily discharge values for February 5 to 10 on account of ice conditions. es for 1906 are excellent.

The following table gives the horsepower (80 per cent effici per foot of all that may be developed at different rates of discl and shows the number of days on which the flow and the corres ing horsepower were, respectively, less than the amounts given i columns for "discharge" and "horsepower."

Discharge and horsepower table for Tippecanoe River near Delphi, Ind., for 1903 t

Discharge in second-feet.	Horsepower, 80 per cent efficiency, per foot fall.	Number of days of deficient flow.			
		1903.	1904.	1905.	1906.[a]
275	25	.....	1	.....	.....
330	30	.....	9	.....	.....
385	35	.....	12	.....	.....
440	40	.....	43	59	2
495	45	.....	67	59	10
550	50	.....	105	63	14
660	60	22	156	84	36
770	70	66	172	111	54
880	80	117	183	125	66
990	90	136	191	146	71
1,100	100	158	200	160	74
1,320	120	197	210	185	86

[a] January 1–July 20.

NOTE.—The minimum flow during the period covered by the above table was 209 second-i ing 24 horsepower per foot of fall, on one day in August, 1904.

WEST BRANCH OF WHITE RIVER AT INDIANAPOLIS, IND.

This station was established May 6, 1904, and was discont July 21, 1906. It is located in the central portion of the city, (bridge of the Cleveland, Cincinnati, Chicago and St. Louis Ra The waterworks canal, which draws water from the river ab miles above the gaging station for the city supply and for powe poses, very seriously modifies the low-water flow of the river. takes at least 25 per cent of the low-water flow. The conditi this station and the bench marks are described in Water-S Paper No. 169, page 83, where are given also references to pu tions that contain data for previous years. The data collect this station are valuable for water-power, water-supply, and se disposal purposes.

Discharge measurements of West Branch White River at Indianapolis, Ind., i

Date.	Hydrographer.	Width.	Area of section.	Gage height.
		Feet.	*Sq. ft.*	*Feet.*
February 14	Brennan and Kriegsman	227	1,160	7.80
February 28	E. F. Kriegsman	221	1,200	8.00
March 30	do	331	3,050	13.64
March 31	do	331	3,700	16.00
June 9	do	226	1,110	7.78

gage height, in feet, of West Branch White River at Indianapolis, Ind., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
.....	8.45	8.5	7.95	16.45	7.85	8.75	7.1
.....	8.25	8.3	8.3	14.55	7.8	8.6	7.1
.....	8.5	7.9	8.8	12.4	7.8	8.4	7.1
.....	10.6	7.85	9.3	11.15	7.75	7.9	7.4
.....	11.85	7.7	9.45	10.7	7.8	8.2	7.15
.....	10.85	7.55	9.0	10.35	7.7	8.0	7.25
.....	9.7	7.6	8.55	10.0	7.65	8.0	7.2
.....	8.2	7.5	8.5	9.9	7.6	7.85	7.15
.....	8.3	7.6	8.6	12.5	7.55	7.8	7.1
.....	8.2	7.55	8.8	13.0	7.55	7.7	7.1
.....	8.3	7.55	8.95	12.0	7.6	7.65	7.15
.....	8.5	7.6	9.2	11.0	7.55	7.5	7.4
.....	8.4	7.6	9.45	10.4	7.55	7.45	7.15
.....	8.25	7.65	9.4	10.75	7.5	7.45	7.05
.....	8.35	7.75	9.35	11.55	7.45	7.4	7.05
.....	9.5	7.85	9.1	11.35	7.3	7.35	7.1
.....	10.1	7.6	9.3	10.4	7.3	7.3	7.05
.....	9.9	7.6	9.45	9.8	7.35	7.3	7.05
.....	9.4	7.65	9.5	9.4	7.5	7.25	7.05
.....	9.1	7.7	9.2	9.1	7.4	7.25	7.05
.....	8.8	7.8	8.9	8.9	7.4	7.25	6.95
.....	11.1	7.9	8.8	8.75	7.35	7.35	.....
.....	12.0	7.95	8.65	8.55	7.4	7.3	.....
.....	11.35	8.0	8.5	8.45	7.4	7.3	.....
.....	10.5	8.2	8.45	8.3	7.4	7.25	.....
.....	9.7	8.4	8.35	8.2	7.35	7.15	.....
.....	9.3	8.35	14.7	8.15	7.35	7.15	.....
.....	9.0	8.0	15.45	8.0	7.5	7.1	.....
.....	8.9	.....	15.6	7.95	7.4	7.1	.....
.....	8.8	.....	13.6	7.9	7.35	7.2	.....
.....	8.6	.....	16.25	.....	7.65	.....	.....

E.—Discharge probably unaffected by ice conditions.

Rating table for West Branch White River at Indianapolis, Ind., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
6.90	240	8.20	1,060	9.50	2,420	11.60	5,820
7.00	280	8.30	1,170	9.60	2,540	11.80	6,230
7.10	325	8.40	1,260	9.70	2,670	12.00	6,650
7.20	375	8.50	1,350	9.80	2,800	12.20	7,090
7.30	430	8.60	1,450	9.90	2,930	12.40	7,540
7.40	490	8.70	1,550	10.00	3,070	12.60	8,000
7.50	550	8.80	1,650	10.20	3,350	12.80	8,470
7.60	615	8.90	1,750	10.40	3,650	13.00	8,950
7.70	680	9.00	1,850	10.60	3,970	14.00	11,570
7.80	750	9.10	1,960	10.80	4,310	15.00	14,570
7.90	830	9.20	2,070	11.00	4,670	16.00	18,000
8.00	910	9.30	2,180	11.20	5,040	16.50	19,830
8.10	990	9.40	2,300	11.40	5,420		

E.—The above table is applicable only for open-channel conditions. It is based on 5 discharge rements made during 1906 and on the form of the 1905 rating curve. It is not very well defined.

Monthly discharge of West Branch White River at Indianapolis, Ind., for 1906.

[Drainage area, 1,520 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inches
January	6,650	1,080	2,490	1.64	1.
February	1,350	550	791	.521	
March	18,900	870	3,940	2.60	3
April	19,600	830	4,290	2.82	3
May	790	430	566	.372	
June	1,600	325	632	.416	
July 1-21	490	260	342	.225	

NOTE.—Values are rated as follows: January and February, good; March and April, excell May, June, and July, fair.

EEL RIVER AT CATARACT, IND.

This station was established August 6, 1903, and was discontinu March 31, 1906. It is located 6 miles from Cloverdale, Ind., and o half mile northeast of Cataract, Ind. It is 300 feet above a da below which there is a fall of 35 feet. The conditions at this stati and the bench marks are described in Water-Supply Paper No. 1 page 85, where are given also references to publications that cont data for previous years. The data collected are valuable for wat power purposes.

Daily gage height, in feet, of Eel River, at Cataract, Ind., for 1906.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	M.
1	2.8	2.9	3.2	17	4.0	2.9	
2	3.0	2.7	3.3	18	4.1	2.8	
3	3.2	2.6	3.4	19	4.2	2.7	
4	3.4	.....	3.3	20	4.2	2.7	
5	3.6	.....	3.3	21	4.1	2.6	
6	3.7	.....	3.2	22	4.0	2.8	
7	3.7	.....	3.2	23	4.0	2.9	
8	3.7	.....	3.1	24	3.9	3.0	
9	3.6	.....	3.0	25	3.9	2.9	
10	3.6	2.7	3.0	26	3.8	2.9	
11	3.6	2.7	3.1	27	3.7	2.9	
12	3.6	2.7	3.1	28	3.6	3.0	
13	3.6	2.6	3.0	29	3.4	.....	
14	3.7	2.6	3.0	30	3.2	.....	
15	3.8	2.8	2.9	31	3.0	.....	
16	3.9	2.9	2.9				

NOTE.—River frozen February 4 to 9.

EAST BRANCH OF WHITE RIVER AT SHOALS, IND.

This station was established June 25, 1903, and was discontinu July 21, 1906. It is located at the highway bridge in the village Shoals, Ind., 400 feet above the Baltimore and Ohio Southweste Railroad bridge. The conditions at this station and the bench mar are described in Water-Supply Paper No. 169, page 86, where a given also references to publications that contain data for previo years. The data collected are valuable for water-power purposes.

Discharge measurements of East Branch of White River at Shoals, Ind., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ıary 15 [a]	Brennan and Kriegsman	341	943	64.90	2,550
ı 1	E. F. Kriegsman	331	967	65.08	3,200
ı 29	do	406	4,390	74.01	20,000
2	do	430	9,400	85.62	37,800
15	do	353	2,510	69.30	12,400

[a] Thin ice running.

ailu gage height, in feet, of East Branch of White River at Shoals, Ind., for 1906.

ıy.	Jan.	Feb.	Mar.	Apr.	May.	June.	Day.	Jan.	Feb.	Mar.	Apr.	May.	June.
.....	65.8	65.5	65.2	84.5	65.0	64.3	17	70.0	64.7	67.1	69.3	64.4	64.0
.....	66.2	65.4	65.1	86.0	65.0	64.3	18	69.8	64.7	66.7	68.8	64.4	63.9
.....	67.8	65.3	67.1	87.4	65.0	64.2	19	69.5	64.7	66.7	67.8	64.3	63.9
.....	76.4	65.2	69.0	88.0	64.9	64.2	20	69.2	64.6	67.0	67.0	64.3	63.9
.....	75.0	65.0	70.8	87.5	64.9	65.1	21	68.0	64.7	68.1	66.7	64.3	63.8
.....	73.5	64.8	70.2	85.7	65.0	64.8	22	67.6	64.9	69.7	66.4	64.3	63.8
.....	73.0	64.6	68.8	82.8	65.1	64.7	23	67.9	65.5	69.8	66.0	64.3	63.9
.....	72.5	64.3	67.4	77.0	65.0	64.5	24	67.7	65.9	69.7	65.8	64.3	63.8
.....	71.3	64.3	66.3	73.2	64.8	64.5	25	67.5	65.8	69.7	65.7	64.2	63.8
.....	69.5	64.4	66.6	72.0	64.7	64.7	26	67.1	65.5	70.0	65.6	64.2	63.8
.....	67.8	64.5	66.6	71.0	64.6	64.6	27	66.7	65.3	70.7	65.4	64.2	63.8
.....	66.6	64.7	66.6	70.5	64.4	64.4	28	66.3	65.2	73.7	65.3	64.2	63.8
.....	66.4	64.7	66.6	70.0	64.5	64.3	29	66.0	.....	74.4	65.2	64.1	63.8
.....	66.2	64.7	66.7	69.8	64.5	64.2	30	65.8	.....	78.2	65.1	64.1	63.8
.....	67.5	64.7	66.9	69.5	64.5	64.1	31	65.6	.....	82.5	.....	64.1	.....
.....	69.1	64.8	67.0	69.2	64.4	64.0							

E. Slight ice conditions during part of February, but flow probably was not much affected y.

ating table for East Branch of White River at Shoals, Ind., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
63.80	880	65.00	2,920	66.20	6,360	67.80	9,700
63.90	1,000	65.10	3,180	66.30	6,580	68.00	10,080
64.00	1,130	65.20	3,460	66.40	6,800	68.20	10,400
64.10	1,270	65.30	3,750	66.50	7,020	68.40	10,840
64.20	1,410	65.40	4,050	66.60	7,240	68.60	11,220
64.30	1,560	65.50	4,360	66.70	7,460	68.80	11,590
64.40	1,720	65.60	4,670	66.80	7,680	69.00	11,950
64.50	1,890	65.70	4,980	66.90	7,900	70.00	13,750
64.60	2,070	65.80	5,280	67.00	8,100	71.00	15,400
64.70	2,260	65.90	5,580	67.20	8,500	72.00	17,000
64.80	2,460	66.00	5,860	67.40	8,900	73.00	18,500
64.90	2,680	66.10	6,120	67.60	9,300	74.00	20,000

RE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1903 to 1906. It is well defined between gage heights 63.2 feet and 65.4 feet. e gage height 72.0 feet the rating curve is a tangent, the difference being 150 per tenth.

Monthly discharge of East Branch of White River at Shoals, Ind., for 1906.

[Drainage area, 4,900 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ıry	23,600	4,670	11,000	2.24	2.58
ıary	5,580	1,560	2,920	.596	.62
ı	32,800	3,180	11,600	2.37	2.73
.....	41,000	3,180	16,700	3.41	3.80
.....	3,180	1,270	1,980	.404	.47
.....	3,180	880	1,400	.285	.32

E.—*Discharge values were not corrected for the effect of ice conditions.* Values for 1906 are nt.

TENNESSEE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Tennessee River is formed by the junction of the French Broad and the Holston, about 4 miles above Knoxville, Tenn. It flows southwestward, crossing into Alabama about 40 miles below Chattanooga, Tenn., and, after crossing the northern part of Alabama, again enters Tennessee in Harding County. It then flows northward, crossing Tennessee and Kentucky, and enters Ohio River at Paducah, about 40 miles above Cairo. Its principal tributary on the north is Clinch River, which enters it near Kingston, Roan County, Tenn. The principal tributaries on the south are Hiwassee and Little Tennessee rivers. The Hiwassee rises in the northern part of Georgia and flows into the Tennessee about 30 miles above Chattanooga. Its principal tributaries are the Okoee and Nottely. Little Tennessee River rises in the northeast corner of Georgia, flows across the southwestern part of North Carolina, and enters the Tennessee near Loudon, Tenn. Its principal tributary is the Tuckasegee. French Broad River rises in the western part of North Carolina. Its principal tributaries are the Pigeon and the Nolichucky. Holston River rises in the western part of Virginia. Its principal tributary is Watauga River.

FRENCH BROAD RIVER AT HORSESHOE, N. C.

This station was established October 4, 1904, and was discontinued March 31, 1906. It is located at the steel highway bridge at Horseshoe, N. C. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 89, where are given also references to publications that contain data for previous years.

Discharge measurements of French Broad River at Horseshoe, N. C., for 1904 to 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1904.					
July 18	B. S. Drane	82	241	0.86	396
August 18	do	82	285	1.51	539
October 3	do	81	192	.51	290
December 7	do	81	318	1.91	564
1905.					
April 12	B. S. Drane	81	439	3.10	888
June 22	do	81	522	3.84	1,160
August 29	do	81	488	3.60	1,110
November 11	W. E. Hall	81	259	1.37	415
1906.					
March 6	W. E. Hall	81	613	4.62	1,410
March 6	do	81	613	4.62	1,420

Daily gage height, in feet, of French Broad River at Horseshoe, N. C., for 1906.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Mar.
.....	3.6	6.7	3.6	17.....	4.4	4.0	5.5
.....	3.4	6.3	3.4	18.....	4.2	3.8	4.9
.....	7.1	5.7	3.7	19.....	4.2	3.8	7.0
.....	12.7	5.5	5.5	20.....	3.9	3.6	9.9
.....	13.0	5.2	5.4	21.....	3.8	8.8	6.8
.....	7.5	5.0	4.8	22.....	8.2	5.5	5.9
.....	5.9	4.9	4.4	23.....	16.0	4.2	5.5
.....	5.4	4.8	4.6	24.....	16.0	4.0	4.9
.....	5.0	4.6	4.8	25.....	14.0	3.9	4.8
.....	4.5	4.4	4.5	26.....	10.0	3.8	4.6
.....	4.2	4.2	4.3	27.....	7.8	3.8	4.5
.....	5.5	4.4	4.0	28.....	7.2	3.7	4.6
.....	5.0	4.4	3.8	29.....	7.1	.....	4.5
.....	5.5	4.3	4.0	30.....	7.0	.....	7.8
.....	4.8	4.2	7.3	31.....	6.9	.....	8.8
.....	4.6	4.2	7.2				

Rating table for French Broad River at Horseshoe, N. C., 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.30	242	1.50	473	2.70	785	3.90	1,165
0.40	258	1.60	496	2.80	815	4.00	1,200
0.50	275	1.70	519	2.90	845	4.20	1,270
0.60	292	1.80	542	3.00	875	4.40	1,340
0.70	310	1.90	566	3.10	905	4.60	1,410
0.80	328	2.00	590	3.20	935	4.80	1,480
0.90	347	2.10	615	3.30	965	5.00	1,550
1.00	367	2.20	640	3.40	995	5.20	1,630
1.10	387	2.30	665	3.50	1,025	5.40	1,710
1.20	408	2.40	695	3.60	1,060	6.00	1,950
1.30	429	2.50	725	3.70	1,095		
1.40	451	2.60	755	3.80	1,130		

TE.—The above table is applicable only for open-channel conditions. It is based on eight discharge urements made during 1904, to 1906. It is well defined between gage heights 0.5 foot and 5.0 feet. e 5.0 feet the rating curve is a tangent, the difference being 40 per tenth.

Monthly discharge of French Broad River at Horseshoe, N. C., 1904 to 1906.

[Drainage area, 325 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
er.....	275	242	256	0.788	0.91
nber.....	710	250	346	1.06	1.18
ber.....	1,950	284	480	1.48	1.71
1905.					
ry.....	3,630	301	918	2.82	3.25
ary.....	3,110	473	1,190	3.66	3.81
.....	1,630	725	994	3.06	3.53
.....	1,130	615	751	2.31	2.58
.....	2,910	695	1,280	3.94	4.54
.....	3,630	554	1,050	3.23	3.60
.....	5,630	935	1,960	6.03	6.95
st.....	3,870	815	1,610	4.95	5.71
mber.....	1,200	542	732	2.25	2.51
er.....	2,310	496	643	1.98	2.28
mber.....	519	408	449	1.38	1.54
nber.....	3,310	429	1,400	4.31	4.97
The year.....	5,630	301	1,080	3.33	45.27
1906.					
ary.....	5,950	995	2,380	7.32	8.44
ary.....	2,230	1,060	1,390	4.28	4.46
.....	3,510	995	1,700	5.23	6.03

TE.—Values for 1904 to 1906 are good.

FRENCH BROAD RIVER NEAR ASHEVILLE, N. C.

This station is located at the steel highway bridge known as Smith Bridge, about 1 mile below the Southern Railway depot at Asheville, N. C., and near the end of the Patton avenue line of the Asheville Street Railway Company. The United States Weather Bureau maintains a station at this place, and furnishes gage height records to the United States Geological Survey. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 90, where are given also references to publications that contain data for previous years.

Discharge measurements of French Broad River near Asheville, N. C., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 1	W. E. Hall	314	1,100	0.43	2,140
April 16	O. P. Hall	336	1,830	2.42	6,300
June 16	W. E. Hall	342	2,400	3.87	10,600

Daily gage height, in feet, of French Broad River near Asheville, N. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.3	2.0	0.4	1.8	0.6	0.1	0.5	0.8	2.2	3.4	0.7	0.7
2	.2	1.8	.4	1.6	.5	.5	.3	.9	2.0	3.4	.6	.6
3	.3	1.6	.5	1.0	.5	.5	.5	.8	1.7	4.3	.5	.5
4	4.0	1.2	2.0	1.0	.5	.4	.7	.7	1.1	5.3	.5	.5
5	3.8	1.1	1.4	.8	.5	.4	.7	.6	1.6	4.9	.5	.5
6	2.9	1.0	1.0	.8	.5	1.4	.7	.5	2.0	4.5	.5	.4
7	1.4	1.0	.6	.7	.6	.8	.5	.8	1.5	3.6	.4	.4
8	1.2	1.0	.6	.7	.5	.4	.3	.7	1.3	3.2	.3	.4
9	1.0	.9	1.0	.6	.3	.4	1.0	.3	1.0	2.6	.3	.4
10	.7	.8	.8	.9	.3	.8	.5	.2	.7	2.3	.2	.4
11	.3	.6	.6	.7	.2	.7	.3	.2	.6	2.0	.2	1.6
12	1.0	.7	.5	.5	.2	.6	.2	.1	.7	1.8	.2	1.1
13	1.1	.9	.5	.5	.2	1.8	.2	.1	1.5	1.7	.2	.8
14	1.3	.7	.5	.6	.1	3.6	.2	1.0	.8	1.5	.1	.6
15	1.1	.6	1.0	3.2	.1	3.5	1.4	1.1	.6	1.4	.1	.5
16	1.0	.5	2.2	2.6	.1	4.2	2.1	.8	.5	1.3	.1	.5
17	.8	.6	1.4	1.6	.1	3.4	1.6	.8	.4	1.3	.1	.6
18	.7	.6	1.0	1.2	.1	3.5	2.5	1.0	.7	1.4	2.0	1.2
19	.7	.6	.9	1.0	.0	2.0	2.9	1.4	5.7	2.6	5.0	.9
20	.5	.5	2.6	.9	.0	1.5	2.1	1.0	5.1	2.0	4.1	.9
21	.5	.5	2.0	.8	.0	1.1	1.5	1.4	4.7	1.6	3.6	.9
22	.8	1.1	1.5	.8	.0	.4	1.5	.7	4.0	1.4	3.1	.8
23	7.8	1.8	1.1	.7	−0.1	.9	2.5	1.0	2.8	1.3	3.0	.7
24	7.0	.6	1.0	.6	−0.1	.9	1.6	.8	2.6	1.3	1.5	.6
25	5.0	.6	.9	.5	−0.2	1.4	1.1	.8	2.1	1.2	1.1	.5
26	3.6	.5	.8	.5	.0	1.1	1.1	.6	2.1	1.1	1.0	.5
27	3.5	.5	.8	.5	1.2	.7	1.4	.9	2.1	1.0	.9	.4
28	2.1	.5	.8	.5	1.0	.8	1.1	2.6	2.2	.9	.9	.4
29	2.2	.....	.9	.5	.6	.6	.7	2.5	3.5	.9	.9	.4
30	2.1	.....	1.5	.8	.3	.6	.8	2.8	3.5	.8	.8	.4
31	2.0	.....	2.2	.....	.1	.....	.7	3.2	.....	.8	.....	1.

Rating table for French Broad River near Asheville, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
−0.20	1,330	1.00	3,170	2.20	5,730	3.80	10,370
−0.10	1,460	1.10	3,350	2.30	5,980	4.00	11,040
0.00	1,590	1.20	3,540	2.40	6,240	4.20	11,730
0.10	1,730	1.30	3,730	2.50	6,500	4.40	12,430
0.20	1,870	1.40	3,930	2.60	6,770	4.60	13,150
0.30	2,020	1.50	4,130	2.70	7,040	4.80	13,890
0.40	2,170	1.60	4,340	2.80	7,320	5.00	14,650
0.50	2,330	1.70	4,660	2.90	7,600	5.20	15,420
0.60	2,490	1.80	4,780	3.00	7,890	5.40	16,200
0.70	2,650	1.90	5,010	3.20	8,480	5.60	17,000
0.80	2,820	2.00	5,240	3.40	9,090	5.80	17,800
0.90	2,990	2.10	5,480	3.60	9,720		

OTE.—The above table is applicable only for open-channel conditions. It is based on 11 discharge asurements made during 1904 to 1906. It is well defined between gage heights −1.0 foot and +5.0 . Above gage height 5.40 the rating curve is a tangent, the difference being 400 per tenth.

Monthly discharge of French Broad River near Asheville, N. C., for 1906.

[Drainage area, 987 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary	25,800	1,870	6,020	6.10	7.03
ruary	5,240	2,330	,010	3.05	3.18
ch	6,770	2,170	,400	3.44	3.97
il	8,480	2,330	3,210	3.25	3.63
	3,540	1,330	2,010	2.04	2.35
e	11,700	1 730	,080	4.13	4.61
	7,600	1,870	3,440	3.49	4.02
gust	8,480	1 730	,330	3.37	3.88
tember	17,400	2,170	5,780	5.86	6.54
ober	15,800	2,820	6,050	6.13	7.07
vember	14,600	1 730	,820	3.87	4.32
ember	4,340	2, 70	610	2.64	3.04
The year	25,800	1,330	3,900	3.94	53.64

OTE.—Values for 1906 are excellent.

TENNESSEE RIVER NEAR KNOXVILLE, TENN.

This station is located at the Gay street or county highway bridge. ge heights are furnished by United States Weather Bureau. The ditions at this station and the bench marks are described in ater-Supply Paper No. 169, page 96, where are given also references publications that contain data for previous years.

Discharge measurements of Tennessee River near Knoxville, Tenn., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
il 23	O. P. Hall	773	4,920	3.03	13,400
e 15	do	880	6,670	5.45	24,900
ober 19	F. A. Murray	839	4,950	2.78	12,500

Daily gage height, in feet, of Tennessee River near Knoxville, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.1	6.6	2.7	5.4	2.2	1.7	1.9	6.5	9.3	7.0	2.2
2	1.9	6.0	2.6	5.0	2.5	2.0	1.7	4.7	7.1	5.8	2.1
3	1.9	5.3	2.7	4.4	2.5	2.1	1.6	4.3	5.1	5.4	2.0
4	3.5	4.6	3.2	3.9	3.0	2.0	1.5	4.7	4.5	7.7	2.0
5	7.4	4.0	3.8	3.5	3.7	2.0	2.2	4.3	4.8	8.4	1.9
6	7.3	3.7	4.0	3.4	4.9	1.9	1.9	3.7	7.4	8.1	1.8
7	5.5	3.6	3.4	3.4	6.1	2.4	1.8	3.3	8.4	8.1	1.8
8	3.9	3.4	3.1	3.5	7.3	2.2	1.9	3.1	5.9	6.7	1.8
9	3.7	3.1	2.9	3.8	6.3	1.9	2.4	3.0	5.2	5.7	1.8
10	3.3	2.9	2.9	5.2	4.6	1.6	2.4	2.4	4.3	4.8	1.7
11	2.9	2.8	2.8	5.2	3.8	1.5	2.2	2.3	3.6	4.1	1.7
12	2.8	2.6	2.6	4.4	3.4	1.7	1.9	2.1	3.1	3.7	1.8
13	3.0	2.6	2.4	3.7	3.0	1.7	1.6	2.1	3.4	3.4	2.3
14	3.7	2.6	2.3	3.3	2.7	3.0	1.4	2.3	3.1	3.1	2.7
15	4.2	2.7	3.4	3.8	2.5	5.6	2.1	3.1	2.8	2.9	2.4
16	4.9	2.7	7.3	6.6	2.3	5.4	2.1	4.2	2.5	2.7	2.1
17	4.9	2.7	8.0	8.1	2.1	5.9	3.8	5.2	2.2	2.6	2.0
18	4.3	2.7	6.5	5.9	2.0	5.0	6.5	4.7	2.0	2.5	2.3
19	3.9	2.5	4.9	4.7	1.9	4.0	5.0	5.0	1.9	2.7	10.0
20	3.7	2.4	4.5	4.0	1.9	3.3	5.2	4.2	10.9	4.2	23.0
21	3.5	2.3	5.2	3.6	1.8	3.0	4.8	4.1	7.9	8.5	17.7
22	3.2	2.6	4.9	3.4	1.9	2.7	4.6	3.9	6.7	7.2	11.4
23	4.7	3.0	4.2	3.0	1.7	2.7	5.0	3.7	5.8	5.2	7.5
24	20.1	3.1	3.9	2.9	1.6	2.7	4.7	4.1	5.0	4.2	5.7
25	18.1	3.0	3.6	2.7	1.5	3.2	3.9	5.2	4.3	3.7	4.8
26	9.9	2.8	3.5	2.5	1.4	3.6	3.2	3.9	4.1	3.3	4.2
27	7.9	2.8	3.6	2.6	1.4	3.2	3.0	3.2	3.6	3.0	3.8
28	7.3	2.7	4.0	2.3	2.2	3.0	2.8	5.8	3.3	2.8	3.5
29	7.2	.....	4.0	2.3	3.0	2.5	3.2	4.4	3.7	2.6	3.3
30	7.0	.....	4.2	2.2	2.5	2.1	3.1	7.7	4.6	2.4	3.1
31	6.7	.....	4.6	.....	2.0	.....	5.6	9.8	.....	2.3	.....

Rating table for Tennessee River near Knoxville, Tenn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	6,590	2.80	12,300	4.20	18,240	6.20	26,660
1.50	6,970	2.90	12,780	4.30	18,660	6.40	27,520
1.60	7,360	3.00	13,200	4.40	19,080	6.60	28,380
1.70	7,760	3.10	13,620	4.50	19,500	6.80	29,240
1.80	8,170	3.20	14,040	4.60	19,920	7.00	30,100
1.90	8,580	3.30	14,460	4.70	20,340	8.00	34,400
2.00	9,000	3.40	14,880	4.80	20,760	9.00	38,900
2.10	9,420	3.50	15,300	4.90	21,180	10.00	43,600
2.20	9,840	3.60	15,720	5.00	21,600	11.00	48,500
2.30	10,260	3.70	16,140	5.20	22,440	12.00	53,700
2.40	10,680	3.80	16,560	5.40	23,280	13.00	59,200
2.50	11,100	3.90	16,980	5.60	24,120	14.00	65,000
2.60	11,520	4.00	17,400	5.80	24,960	15.00	71,000
2.70	11,940	4.10	17,820	6.00	25,800	16.00	77,000

NOTE.—The above table is applicable only for open-channel conditions. It is based on measurements made during 1899 to 1906. It is well defined up to gage height of 24 feet. At height 14.0 feet the rating curve is a tangent, the difference being 600 per tenth.

'onthly discharge of Tennessee River near Knoxville, Tenn., for 1906.

[Drainage area, 8,990 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	102,000	8,580	25,300	2.81	3.24
.....	28,400	10,300	14,400	1.60	1.67
.....	34,400	10,300	17,100	1.90	2.19
.....	34,800	9,840	17,200	1.91	2.13
.....	31,400	6,590	12,800	1.42	1.64
.....	25,400	6,970	12,600	1.40	1.56
.....	28,000	6,590	13,500	1.50	1.73
.....	42,600	9,420	18,400	2.05	2.36
.....	48,000	8,580	21,200	2.36	2.63
..?.....	36,600	10,300	20,300	2.26	2.61
.....	119,000	7,760	20,700	2.30	2.57
.....	48,000	9,420	15,800	1.76	2.03
ar.....	119,000	6,590	17,400	1.94	26.36

lues for 1906 are excellent.

TENNESSEE RIVER AT CHATTANOOGA, TENN.

tation was established in 1879, at the foot of Lookout street, w Chattanooga Island, by the Signal Corps of the United rmy, but since July 1, 1891, it has been in charge of the Bureau. Gage heights are furnished to the Geological Surugh L. M. Pindell. The conditions at this station and the arks are described in Water-Supply Paper No. 169, page 99, e given also references to publications that contain data for years.

harge measurements of Tennessee River at Chattanooga, Tenn., in 1906.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
...	F. A. Murray.....	1,120	13,100	8.36	52,800
...	O. P. Hall.....	1,040	7,690	3.40	19,800
...	....do.....	1,080	9,810	5.45	31,300
...	F. A. Murray.....	1,080	10,100	5.59	31,900

Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.5	9.6	5.3	14.8	4.9	4.1	4.6	7.7	13.0	13.9	1.5	6.1
2	5.1	9.1	5.2	12.4	4.8	3.8	4.2	9.0	11.7	19.2	4.4	6.1
3	5.0	8.8	5.5	10.6	4.8	4.1	3.9	9.5	10.3	19.3	4.3	5.7
4	8.3	8.3	8.2	9.2	4.9	4.3	3.7	8.2	8.9	17.9	4.2	5.6
5	12.0	7.7	9.4	8.3	5.1	4.3	3.5	7.6	7.7	13.8	3.9	5.5
6	12.9	7.0	8.6	7.5	5.5	4.3	3.5	7.9	7.9	13.6	3.9	5.3
7	12.1	6.5	7.7	7.1	6.0	4.1	3.7	7.3	9.1	15.3	3.9	5.3
8	10.9	6.1	7.2	6.9	7.2	3.9	3.7	6.9	10.4	15.4	3.8	5.6
9	9.1	5.8	6.7	6.9	8.2	3.9	4.4	6.2	10.4	13.4	3.7	5.5
10	8.5	5.6	6.3	7.4	8.9	3.8	5.4	5.8	9.3	11.4	3.6	5.3
11	7.6	5.3	5.9	8.6	8.3	3.6	5.5	5.5	9.2	9.9	3.5	5.2
12	7.0	5.0	5.7	9.3	7.0	3.2	5.2	5.2	8.8	8.6	3.5	5.6
13	6.7	4.8	5.4	8.7	6.1	3.2	4.5	4.9	8.0	7.6	3.5	5.6
14	6.9	4.7	5.1	8.1	5.5	4.4	4.7	4.7	7.0	7.0	3.7	5.5
15	6.9	4.7	5.7	8.4	5.1	5.4	6.7	5.1	6.2	6.4	4.0	5.4
16	7.4	4.6	7.3	8.7	4.8	7.8	8.7	6.3	5.7	6.0	4.1	5.3
17	8.0	4.6	9.9	9.4	4.5	9.2	7.9	7.3	5.2	5.7	4.4	5.1
18	8.9	4.5	10.6	10.1	4.2	8.6	9.3	7.2	4.9	5.6	4.4	5.0
19	8.7	4.5	10.4	10.2	4.0	7.7	14.2	7.6	4.8	7.0	8.2	8.5
20	8.0	4.4	10.7	8.9	3.8	6.8	15.0	7.7	6.1	7.1	22.1	9.2
21	7.5	4.4	10.6	7.7	3.7	6.0	10.8	7.7	8.1	6.9	31.6	8.9
22	7.3	4.9	9.7	7.0	3.6	5.5	10.3	7.3	11.1	7.0	33.3	9.3
23	8.7	5.5	8.9	6.5	3.5	5.1	12.0	6.9	10.3	8.9	31.0	8.4
24	12.4	6.0	8.1	6.0	3.5	4.9	13.7	6.5	9.2	8.4	22.0	7.7
25	17.4	5.8	7.4	5.7	3.4	6.0	12.3	6.5	8.5	7.4	13.0	7.3
26	21.4	5.5	6.9	5.4	3.3	6.6	9.7	7.1	7.7	6.6	9.7	6.6
27	18.9	5.3	6.7	5.2	3.3	6.7	8.1	7.3	7.0	6.0	8.6	6.1
28	13.4	5.2	6.9	5.3	3.7	6.2	7.5	6.7	6.6	5.6	7.7	5.8
29	11.1	.....	7.6	5.6	3.9	5.5	7.2	6.5	5.9	5.2	7.2	5.9
30	10.2	.....	9.6	5.3	4.1	5.0	6.6	7.7	6.1	4.9	6.8	10.1
31	10.1	.....	13.7	.....	4.6	.....	7.0	9.7	.....	4.7	.....	16.3

Rating table for Tennessee River at Chattanooga, Tenn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.20	17,920	4.00	22,300	4.80	27,070	5.60	32,120
3.30	18,460	4.10	22,940	4.90	27,680	5.70	32,780
3.40	19,000	4.20	23,520	5.00	28,300	5.80	33,450
3.50	19,550	4.30	24,100	5.10	28,920	5.90	34,120
3.60	20,100	4.40	24,690	5.20	29,550	6.00	34,800
3.70	20,660	4.50	25,280	5.30	30,180	7.00	41,600
3.80	21,220	4.60	25,870	5.40	30,820	8.00	48,400
3.90	21,790	4.70	26,470	5.50	31,470		

NOTE.—The above table is applicable only for open-channel conditions. It is based on [illegible] measurements made during 1893 to 1906. It is well defined up to gage height of 20 feet. A[illegible] height 6.0 feet the rating curve is a tangent, the difference being 680 per tenth.

Monthly discharge of Tennessee River at Chattanooga, Tenn., for 1906.

[Drainage area, 21,400 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	140,000	28,300	60,600	2.83	3.26
.....	59,300	24,700	34,100	1.59	1.66
.....	87,200	28,900	47,300	2.21	2.55
.....	94,600	29,600	48,700	2.28	2.54
.....	54,500	18,500	28,600	1.34	1.54
.....	56,600	17,900	30,400	1.42	1.58
.....	96,000	19,600	44,300	2.07	2.39
.....	60,000	26,500	41,800	1.95	2.25
.....	82,400	27,100	49,600	2.32	2.59
.....	125,000	26,500	58,900	2.75	3.17
.....	220,000	19,600	56,300	2.63	2.93
.....	105,000	28,900	40,100	1.87	2.16
ear.....	220,000	17,900	45,100	2.10	28.62

alues for 1906 are excellent.

DAVIDSONS RIVER NEAR DAVIDSONS RIVER, N. C.

station was established May 19, 1904. It is located at Eng-dge, about 2 miles from Davidsons River, N. C., and about t above the mouth of Avery Creek. The conditions at this and the bench marks are described in Water-Supply Paper), page 101, where are given also references to publications ntain data for previous years.

Measurements of Davidsons River near Davidsons River, N. C.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
..	W. E. Hall.....	67	124	1.25	129
...	.....do.....	77	236	2.74	1,020

Daily gage height, in feet of Davidsons River near Davidsons River, N. C., for 19

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1.05	1.45	1.1	1.5	1.1	1.05	1.25	1.4	1.6	2.1	1.2
2	1.0	1.4	1.1	1.45	1.1	1.2	1.5	1.4	1.5	2.6	1.2
3	2.5	1.35	1.9	1.4	1.1	1.3	1.65	1.45	1.45	3.2	1.2
4	1.9	1.3	1.45	1.35	1.1	1.25	1.6	1.4	1.4	2.5	1.2
5	1.55	1.3	1.3	1.3	1.1	1.65	1.45	1.4	1.95	2.1	1.15
6	1.4	1.3	1.25	1.3	1.1	1.5	1.4	1.45	1.75	2.1	1.15
7	1.3	1.25	1.2	1.25	1.1	1.3	1.35	1.42	1.6	1.9	1.15
8	1.25	1.25	1.35	1.25	1.05	1.2	1.3	1.35	1.55	1.8	1.15
9	1.25	1.25	1.25	1.3	1.05	1.15	1.4	1.3	1.75	1.75	1.1
10	1.2	1.2	1.2	1.25	1.05	1.55	1.3	1.3	1.4	1.65	1.1
11	1.15	1.2	1.2	1.2	1.0	1.45	1.25	1.25	1.35	1.65	1.1
12	1.25	1.25	1.15	1.2	1.0	1.75	1.25	1.2	1.35	1.6	1.1
13	1.25	1.2	1.15	1.2	1.0	3.5	1.2	1.3	1.4	1.55	1.1
14	1.3	1.2	1.15	1.7	1.0	2.2	1.2	1.25	1.3	1.5	1.1
15	1.2	1.2	1.7	1.7	1.0	2.5	2.15	1.4	1.3	1.5	1.1
16	1.25	1.15	1.35	1.5	1.0	2.1	1.85	1.3	1.3	1.45	1.15
17	1.2	1.15	1.3	1.4	.95	2.0	1.95	1.6	1.25	1.45	1.15
18	1.15	1.15	1.25	1.35	.95	1.8	1.85	1.5	2.7	1.7	2.85
19	1.15	1.1	1.6	1.3	1.0	1.7	1.7	1.6	3.0	1.55	2.45
20	1.15	1.1	1.5	1.3	1.0	1.6	1.6	1.5	2.0	1.5	1.8
21	1.15	1.45	1.4	1.25	.95	1.5	1.5	1.4	1.8	1.45	1.6
22	4.1	1.25	1.35	1.25	.95	1.45	1.45	1.35	1.7	1.4	1.5
23	2.6	1.15	1.3	1.2	.95	1.4	1.4	1.35	1.85	1.4	1.4
24	2.05	1.15	1.25	1.2	.95	1.45	1.4	1.45	1.75	1.35	1.4
25	1.8	1.15	1.25	1.2	.9	1.4	1.4	1.35	1.8	1.35	1.3
26	1.75	1.1	1.2	1.15	1.7	1.35	1.65	1.45	1.7	1.3	1.3
27	1.6	1.2	1.3	1.15	1.6	1.3	1.7	1.4	1.75	1.3	1.3
28	1.55	1.1	1.2	1.15	1.4	1.25	1.65	1.35	2.0	1.3	1.25
29	1.5	.....	1.75	1.15	1.25	1.25	1.5	1.5	2.5	1.25	1.2
30	1.5	.....	2.0	1.15	1.15	1.25	1.45	1.5	2.6	1.25	1.2
31	1.5	.....	1.7	.....	1.1	.....	1.4	1.8	.....	1.25	.....

Rating table for Davidsons River near Davidsons River, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	60	1.50	210	2.10	520	2.70	985
1.00	79	1.60	250	2.20	590	2.80	1,075
1.10	100	1.70	295	2.30	660	2.90	1,170
1.20	122	1.80	345	2.40	735	3.00	1,265
1.30	147	1.90	400	2.50	815	3.20	1,460
1.40	176	2.00	460	2.60	895	3.40	1,660

NOTE.—The above table is applicable only for open-channel conditions. It is based on disch measurements made during 1904 to 1906. It is well defined between gage heights 0.7 foot and 1.3 Above gage height 3.1 feet the rating curve is a tangent, the difference being 100 per tenth.

nthly discharge of Davidsons River near Davidsons River, N. C., for 1906.

[Drainage area, 41 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft per sq. mile.	Depth in inches.
.....	2,360	79	297	7.24	8.35
r.....	193	100	130	3.17	3.30
.....	460	100	177	4.32	4.98
.....	295	111	152	3.71	4.14
.....	295	60	102	2.49	2.87
.. ..	1,760	90	293	7.15	7.98
.....	555	122	226	5.51	6.35
.....	400	122	189	4.61	5.32
er.....	1,260	134	356	8.68	9.68
.....	1,460	134	325	7.93	9.14
er.....	1,120	100	191	4.66	5.20
r.....	430	100	162	3.95	4.55
e year.....	2,360	60	217	5.28	71.86

—Values are rated as follows: January, June, September, and October, good; remaining months,

NORTH FORK OF MILLS RIVER AT PINKBED, N. C.

s station was established May 18, 1904. It is located at the ı bridge in the village of Pinkbed, N. C. The conditions at this n and the bench marks are described in Water-Supply Paper No. age 105, where are given also references to publications that con- ata for previous years.

:harge measurements of North Fork of Mills River at Pinkbed, N. C., in 1906.

:e.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
		Feet.	*Sq. ft.*	*Feet*	*Sec.-ft.*
.....	W. E. Hall.....	38	81	2.22	351
er 15..	.....do.....	30	40	1.19	92
er 15..	.....do.....	39	41	1.19	93

Daily gage height, in feet, of North Fork of Mills River at Pinkbed, N. C., for 19

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	0.9	1.45	1.0	1.5	1.05	0.9	1.2	1.1	1.5	2.3	1.25
2	.9	1.4	.95	1.4	1.0	1.1	1.15	1.1	1.4	2.3	1.2
3	2.2	1.35	1.5	1.3	1.0	.9	1.15	1.15	1.3	3.1	1.2
4	2.0	1.35	1.3	1.25	1.0	1.1	1.1	1.1	1.25	2.8	1.2
5	1.55	1.3	1.1	1.3	1.0	1.2	1.1	1.1	1.45	2.45	1.2
6	1.4	1.25	1.1	1.25	1.0	1.1	1.1	1.1	1.45	2.3	1.2
7	1.3	1.25	1.1	1.2	1.0	1.0	1.1	1.1	1.4	2.1	1.2
8	1.2	1.2	1.1	1.15	1.0	1.0	1.1	1.1	1.3	1.95	1.15
9	1.1	1.15	1.1	1.1	1.0	1.0	1.2	1.1	1.4	1.85	1.15
10	1.1	1.1	1.05	1.1	.95	1.0	1.1	1.05	1.35	1.8	1.15
11	1.1	1.1	1.0	1.1	.95	1.1	1.1	1.0	1.25	1.7	1.1
12	1.2	1.15	1.0	1.1	.9	1.2	1.1	1.0	1.2	1.65	1.1
13	1.15	1.1	1.0	1.1	.9	3.7	1.05	1.0	1.2	1.6	1.1
14	1.2	1.1	1.0	1.3	.9	2.4	1.05	1.1	1.3	1.55	1.1
15	1.15	1.1	1.5	1.8	.9	3.7	1.5	1.1	1.2	1.55	1.1
16	1.15	1.05	1.15	1.5	.85	2.3	1.45	1.1	1.2	1.5	1.1
17	1.1	1.05	1.1	1.4	.75	2.1	1.3	1.1	1.15	1.5	1.1
18	1.1	1.05	1.05	1.3	.75	1.9	1.4	1.1	2.0	1.55	1.4
19	1.1	1.05	1.6	1.3	.7	1.7	1.6	1.1	3.1	1.6	2.6
20	1.05	1.00	1.4	1.25	.8	1.6	1.55	1.05	2.2	1.55	1.7
21	1.05	1.3	1.4	1.2	.8	1.5	1.4	1.15	1.9	1.5	1.6
22	4.0	1.1	1.35	1.15	.8	1.5	1.4	1.1	1.8	1.45	1.5
23	3.0	1.05	1.2	1.15	.8	1.4	1.3	1.05	1.7	1.4	1.5
24	2.2	1.0	1.1	1.1	.8	1.4	1.2	1.05	1.65	1.4	1.4
25	1.9	1.0	1.1	1.1	.75	1.35	1.2	1.0	1.7	1.4	1.35
26	1.8	1.0	1.1	1.1	1.6	1.3	1.2	1.0	1.6	1.35	1.3
27	1.6	1.1	1.15	1.1	1.1	1.3	1.2	1.05	1.65	1.3	1.3
28	1.55	1.0	1.1	1.1	1.05	1.25	1.15	1.5	1.8	1.3	1.3
29	1.5	.....	1.55	1.05	1.0	1.2	1.1	1.6	2.4	1.3	1.25
30	1.5	.....	1.8	1.05	.9	1.2	1.1	1.7	2.4	1.25	1.25
31	1.5	.....	1.6	.....	.9	.....	1.1	1.8	.....	.....	.....

Rating table for North Fork of Mills River at Pinkbed, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.70	35	1.60	175	2.50	440	3.40	830
0.80	45	1.70	200	2.60	475	3.50	880
0.90	56	1.80	225	2.70	515	3.60	930
1.00	68	1.90	250	2.80	555	3.70	990
1.10	81	2.00	280	2.90	595	3.80	1,050
1.20	95	2.10	310	3.00	640	3.90	1,110
1.30	110	2.20	340	3.10	685	4.00	1,170
1.40	130	2.30	370	3.20	730		
1.50	150	2.40	405	3.30	780		

NOTE.—The above table is applicable only for open-channel conditions. It is based on disc measurements made during 1904 to 1906. It is fairly well defined between gage heights 0.5 foc 1.2 feet.

Monthly discharge of North Fork of Mills River at Pinkbed, N. C., for 1906.

[Drainage area, 24 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
nuary	1,170	56	185	7.71	8.89
bruary	140	68	88.6	3.69	3.84
arch	225	62	102	4.25	4.90
pril	225	74	102	4.25	4.74
ay	175	35	61.5	2.56	2.95
ne	990	56	193	8.04	8.97
ly	175	74	100	4.17	4.81
ugust	225	68	92.0	3.83	4.42
ptember	685	88	190	7.92	8.84
ctober	685	102	221	9.21	10.62
ovember	475	81	119	4.96	5.53
ecember	225	81	90.4	3.77	4.35
The year	1,170	35	129	5.03	72.86

NOTE.—Values for 1906 are good.

SOUTH FORK OF MILLS RIVER NEAR SITTON, N. C.

This station was established May 18, 1904. It is located at Sycamore Church, about 1 mile below Sitton's mill, Sitton, N. C. The conditions at this station and the bench marks are described in Water Supply Paper No. 169, page 107, where are given also references to publications that contain data for previous years.

Discharge measurements of South Fork of Mills River near Sitton, N. C., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ne 14	W. E. Hall	55	183	3.38	730
ptember 15	do	50	100	1.61	174
ptember 15	do	50	97	1.61	170

Daily gage height, in feet, of South Fork of Mills River near Sitton, N. C., for 19

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1.15	1.8	1.35	2.0	1.45	1.3	1.55	1.6	2.15	3.0	1.65
2	1.15	1.75	1.35	1.85	1.4	1.5	1.5	1.55	1.9	3.8	1.6
3	3.0	1.65	2.3	1.75	1.4	1.9	1.7	1.6	1.85	5.2	1.6
4	2.55	1.6	1.9	1.7	1.4	1.7	1.65	1.6	1.75	4.0	1.6
5	2.0	1.6	1.7	1.65	1.35	2.1	1.55	1.5	2.6	3.2	1.6
6	1.75	1.55	1.6	1.6	1.35	2.0	1.5	1.5	2.35	3.3	1.55
7	1.6	1.5	1.55	1.6	1.35	1.7	1.5	1.55	2.2	2.8	1.55
8	1.5	1.5	1.7	1.55	1.3	1.55	1.65	1.45	2.0	2.65	1.5
9	1.4	1.5	1.55	1.55	1.3	1.7	1.65	1.4	1.9	2.5	1.5
10	1.4	1.45	1.5	1.55	1.3	2.1	1.5	1.4	1.8	2.35	1.5
11	1.35	1.45	1.5	1.5	1.3	1.85	1.45	1.35	1.7	2.3	1.5
12	1.5	1.5	1.45	1.5	1.3	2.4	1.4	1.3	1.7	2.25	1.5
13	1.4	1.45	1.4	1.45	1.25	5.8	1.4	1.4	1.8	2.1	1.45
14	1.5	1.45	1.4	2.5	1.25	3.7	1.9	1.55	1.7	2.05	1.45
15	1.4	1.45	2.05	2.3	1.25	4.2	2.4	1.5	1.65	2.0	1.45
16	1.4	1.4	1.7	1.9	1.25	3.7	2.1	1.45	1.6	1.95	1.45
17	1.35	1.4	1.6	1.8	1.2	2.85	2.1	1.9	1.6	2.0	1.55
18	1.3	1.4	1.55	1.7	1.2	2.45	2.1	1.75	4.0	2.35	4.0
19	1.3	1.35	2.35	1.6	1.2	2.3	2.35	1.55	4.8	2.2	3.9
20	1.3	1.35	2.0	1.6	1.2	2.1	2.1	2.7	3.2	2.05	2.05
21	1.25	1.5	1.8	1.55	1.2	2.0	2.0	1.9	2.65	2.0	2.3
22	5.6	1.5	1.7	1.55	1.2	1.9	1.85	1.8	2.5	1.95	2.1
23	4.3	1.4	1.65	1.5	1.15	1.8	1.75	1.6	2.3	1.9	2.0
24	2.9	1.4	1.6	1.5	1.15	1.8	1.7	1.75	2.3	1.9	1.9
25	2.45	1.4	1.55	1.45	1.15	1.8	1.65	1.55	2.35	1.85	1.85
26	2.4	1.35	1.5	1.4	1.8	1.8	1.9	1.65	2.2	1.8	1.8
27	2.2	1.4	1.55	1.45	2.25	1.65	1.75	1.75	2.25	1.8	1.75
28	2.0	1.35	1.55	1.4	1.8	1.7	1.65	2.4	2.45	1.75	1.7
29	1.9	.....	2.2	1.4	1.5	1.6	1.6	2.9	3.9	1.7	1.7
30	1.85	.....	2.6	1.4	1.4	1.6	1.55	2.3	3.4	1.7	1.65
31	1.85	.....	2.25	.....	1.35	.....	1.55	2.6	.....	1.7	.....

Rating table for South Fork of Mills River near Sitton, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.10	90	1.90	250	2.70	480	3.50	780
1.20	107	2.00	275	2.80	515	3.60	825
1.30	125	2.10	300	2.90	550	3.70	870
1.40	145	2.20	325	3.00	585	3.80	915
1.50	165	2.30	355	3.10	620	3.90	960
1.60	185	2.40	385	3.20	660	4.00	1,005
1.70	205	2.50	415	3.30	700	4.20	1,100
1.80	225	2.60	445	3.40	740	4.40	1,200

NOTE.—The above table is applicable only for open-channel conditions. It is based on discha measurements made during 1904 to 1906. It is well defined between gage heights 0.7 foot and 1.7 fe Above gage height 4.1 feet the rating curve is a tangent, the difference being 50 per tenth.

ly discharge of South Fork of Mills River near Sitton, N. C., for 1906.

[Drainage area, 40.5 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	1,800	98	306	7.56	8.72
.....	225	135	161	3.98	4.14
.....	445	135	216	5.33	6.14
.....	415	145	197	4.86	5.42
.....	340	98	137	3.38	3.90
.....	1,900	125	378	9.33	10.41
.....	385	145	218	5.38	6.20
.....	550	125	222	5.48	6.32
.....	1,400	185	403	9.95	11.10
.....	1,600	205	414	10.22	11.78
.....	1,000	155	260	6.42	7.16
.....	600	145	197	4.86	5.60
r.....	1,900	98	259	6.40	86.89

lues for 1906 are excellent.

NOLICHUCKY RIVER NEAR GREENEVILLE, TENN.

ation was established May 7, 1903. It is located at Jones's miles southeast of Greeneville, Tenn. The conditions at this nd the bench marks are described in Water-Supply Paper page 112, where are given also references to publications ain data for previous years.

rge measurements of Nolichucky River near Greeneville, Tenn., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
O. P. Hall.....	267	764	0.60	1,060
F. A. Murray.....	275	1,490	3.21	6,020
.....do.....	275	1,460	3.06	5,770

Daily gage height, in feet, of Nolichucky River near Greeneville, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.6	2.35	1.0	2.0	0.95	0.6	0.7	1.1	3.0	2.55	1.0	1.15
2	.55	2.1	1.0	1.7	1.0	.7	.7	1.2	2.25	2.6	.95	1.1
3	.55	1.85	1.05	1.5	1.05	.95	.6	2.7	1.9	3.4	.95	1.05
4	3.8	1.65	2.15	1.35	1.5	.7	.7	2.0	3.2	4.4	.9	1.05
5	2.0	1.6	1.5	1.25	3.1	.7	1.0	2.1	3.25	2.9	.9	1.0
6	1.45	1.5	1.35	1.25	3.0	.6	.7	1.5	2.65	2.4	.85	1.0
7	1.15	1.35	1.2	1.4	2.95	.6	.75	1.35	2.1	2.5	.8	1.0
8	1.0	1.25	1.15	1.25	2.45	.6	.95	1.15	2.1	2.0	.8	1.0
9	1.0	1.2	1.25	1.2	1.9	.5	.9	1.05	1.9	1.9	.8	.9
10	.85	1.15	1.15	1.4	1.65	.6	1.1	.95	1.5	1.65	.75	.9
11	.7	1.1	1.0	1.5	1.45	.55	.75	.8	1.4	1.5	.75	1.0
12	.9	1.05	.95	1.25	1.3	.5	.6	.75	1.8	1.35	1.1	1.2
13	1.35	1.2	.95	1.15	1.2	1.0	.55	.8	1.35	1.3	.95	1.0
14	1.15	1.3	.9	1.1	1.1	3.5	.5	1.3	1.3	1.25	.8	.95
15	1.7	1.35	1.0	5.0	1.0	1.5	.55	1.9	1.2	1.2	.75	.9
16	1.4	1.45	3.2	2.8	1.0	2.9	1.8	1.65	1.0	1.15	.75	.9
17	1.3	1.3	2.2	2.1	.9	2.0	1.8	2.6	1.0	1.3	.75	.9
18	1.2	1.15	1.75	1.8	.9	1.5	1.85	2.2	1.2	1.5	1.0	1.2
19	1.25	1.1	1.55	1.6	.85	1.2	1.35	1.8	8.2	3.5	9.5	1.2
20	1.2	1.05	1.7	1.45	.8	1.1	1.7	1.65	4.0	3.2	5.6	1.2
21	1.1	1.0	1.7	1.3	.8	1.0	1.9	1.6	2.7	3.0	3.2	1.3
22	1.0	1.25	1.5	1.25	.7	.95	1.5	1.7	2.6	1.9	2.35	1.2
23	15.2	1.5	1.4	1.2	.7	.95	1.5	1.5	2.2	1.75	2.0	1.1
24	4.6	1.3	1.3	1.1	.65	.8	1.3	1.35	1.9	1.65	1.75	1.0
25	3.0	1.2	1.35	1.0	.6	1.9	1.0	1.2	1.5	1.5	1.6	[illegible]
26	2.5	1.2	1.35	1.0	.6	1.5	1.2	1.05	1.5	1.4	1.5	.8
27	2.5	1.3	1.35	.95	.9	1.05	1.8	2.2	1.4	1.3	1.4	1.0
28	2.3	1.2	1.4	.9	1.45	.8	1.1	2.1	2.25	1.2	1.3	4.1
29	2.25	.....	1.4	.9	.95	.7	1.3	2.8	2.55	1.15	1.25	4.0
30	2.3	.....	1.45	.85	.8	.65	1.25	4.1	3.2	1.1	1.2	2.0
31	2.3	.....	2.5	.....	.7	.....	1.1	5.4	.....	1.05	.....	2.1

Rating table for Nolichucky River near Greeneville, Tenn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.50	940	1.10	1,740	1.60	2,580	2.10	3,540
0.60	1,060	1.20	1,900	1.70	2,760	2.20	3,750
0.70	1,180	1.30	2,060	1.80	2,950	2.30	3,960
0.80	1,310	1.40	2,230	1.90	3,140	2.40	4,180
0.90	1,450	1.50	2,400	2.00	3,340	2.50	4,400
1.00	1,590						

NOTE.—The above table is applicable only for open-channel conditions. It is based on three discharge measurements made during 1906 and on the general form of previous curves. There has been considerable change in the conditions of flow at this station, but the above rating is fairly good. Above gage height 2.3 feet the rating curve is a tangent, the difference being 220 per tenth.

Monthly discharge of Nolichucky River near Greeneville, Tenn., for 1906.

[Drainage area, 1,100 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
nuary	32,300	1,000	3,760	3.42	3.94
bruary	4,070	1,590	2,180	1.98	2.06
arch	5,940	1,430	2,360	2.15	2.48
ril	9,900	1,380	2,460	2.24	2.50
y	5,720	1,060	2,110	1.92	2.21
ne	6,600	940	1,840	1.67	1.86
ly	3,140	940	1,820	1.65	1.90
gust	10,800	1,240	3,070	2.79	3.22
ptember	16,900	1,590	4,020	3.65	4.07
tober	8,580	1,660	3,370	3.06	3.53
ovember	19,800	1,240	2,850	2.59	2.89
ecember	8,360	1,240	2,270	2.06	2.38
The year	32,300	940	2,680	2.43	33.04

NOTE.—Values for 1906 are good.

SOUTH FORK OF HOLSTON RIVER AT BLUFF CITY, TENN.

This station, originally established by the United States Weather Bureau, is located at the highway bridge at Bluff City, Tenn. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 115, where are given also references to publications that contain data for previous years.

Discharge measurements of South Fork of Holston River at Bluff City, Tenn., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ay 26	O. P. Hall	170	437	0.85	666
ctober 24	F. A. Murray	248	778	2.39	1,760
ctober 24	do	248	683	2.13	1,440

Daily gage height, in feet, of South Fork of Holston River at Bluff City, Tenn., for 19

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	1.0	2.6	1.1	2.5	1.1	0.7	0.6	2.3	2.5	1.0	1.2	
2	.9	2.3	1.1	2.1	1.2	.7	.6	2.0	1.8	1.0	1.1	
3	.9	2.0	1.1	1.9	1.2	.7	.5	1.9	1.6	1.2	1.0	
4	3.3	1.8	1.5	1.8	1.9	.6	.9	1.7	2.8	1.2	1.0	
5	3.2	1.8	1.4	1.6	2.7	.6	.9	2.4	3.2	1.7	1.0	
6	2.4	1.7	1.3	1.6	3.6	.7	.8	2.1	2.3	1.6	1.0	
7	1.9	1.6	1.3	2.6	3.8	.5	.6	1.8	2.3	2.0	.9	
8	1.7	1.6	1.2	2.3	3.2	.5	.5	1.5	2.0	2.1	.9	
9	1.5	1.4	1.2	2.1	2.6	.5	.6	1.4	1.6	1.7	.9	
10	1.2	1.4	1.2	2.2	2.2	.5	.6	1.5	1.5	1.5	.9	
11	1.2	1.2	1.1	2.0	2.0	1.1	.6	1.9	1.3	1.3	1.1	
12	1.3	1.2	1.0	1.8	1.7	.9	.5	1.5	2.4	1.2	2.4	
13	1.7	1.2	1.0	1.7	1.7	.7	.5	2.2	1.7	1.0	2.0	
14	2.2	1.2	1.0	1.6	1.6	.7	.4	2.3	1.3	1.0	1.7	
15	2.7	1.3	1.5	4.0	1.4	.7	.4	3.4	1.2	.9	1.4	
16	2.5	1.3	3.5	4.0	1.4	.8	.6	2.5	1.0	.8	1.4	
17	2.3	1.2	2.9	3.0	1.2	1.1	.7	3.0	.9	.9	1.3	
18	2.1	1.2	2.3	2.6	1.3	1.2	1.3	2.4	.9	.8	1.4	
19	2.1	1.2	2.0	2.1	1.3	1.0	1.2	1.9	.9	1.3	4.8	
20	1.9	1.1	2.4	1.9	1.4	1.4	.9	1.5	.8	6.0	5.8	
21	1.8	1.1	2.5	1.7	1.2	1.6	1.1	1.8	.8	4.0	3.7	
22	1.7	1.4	2.3	1.6	1.1	1.3	1.6	2.1	1.0	3.0	3.0	
23	10.0	1.5	2.0	1.6	1.0	1.0	1.9	1.7	1.5	2.5	2.6	
24	5.6	1.4	1.8	1.6	.9	.8	1.6	1.9	2.0	2.2	2.2	
25	3.8	1.3	1.8	1.4	.9	1.1	1.3	1.9	1.5	1.9	1.9	
26	3.1	1.3	1.6	1.4	.8	1.8	1.2	1.5	1.3	1.7	1.7	
27	2.7	1.3	1.7	1.3	.9	1.5	1.5	1.3	1.0	1.6	1.6	
28	2.9	1.3	1.9	1.2	.9	1.1	1.6	1.3	1.0	1.5	1.6	
29	2.8	.....	2.0	1.2	1.0	.9	1.3	1.2	.9	1.5	1.5	
30	2.7	.....	1.9	1.2	.9	.8	3.0	2.0	1.0	1.3	1.4	
31	2.6	.....	2.1	.....	.8	.....	3.0	2.9	.....	1.2	.....	

Rating table for South Fork of Holston River at Bluff City, Tenn., for 1905 an

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.20	235	1.40	870	2.60	2,070	3.80	3,800
0.30	265	1.50	950	2.70	2,190	3.90	3,9[illegible]0
0.40	300	1.60	1,030	2.80	2,310	4.00	4,100
0.50	340	1.70	1,120	2.90	2,4[illegible]0	4.20	4,530
0.60	385	1.80	1,210	3.00	2,550	4.40	4,910
0.70	435	1.90	1,310	3.10	2,680	4.60	5,310
0.80	485	2.00	1,410	3.20	2,820	4.80	5,730
0.90	540	2.10	1,510	3.30	2,970	5.00	6,180
1.00	600	2.20	1,620	3.40	3,120	5.20	6,650
1.10	665	2.30	1,730	3.50	3,280	5.40	7,130
1.20	730	2.40	1,840	3.60	3,450	5.60	7,630
1.30	800	2.50	1,950	3.70	3,620	5.80	8,130

NOTE.—The above table is based on discharge measurements made during 1904–1906. It is wel[illegible] between gage heights 0.5 foot and 3.5 feet. Above gage height 5.4 feet the rating curve is a [illegible] the difference being 250 per tenth.

ischarge of South Fork of Holston River at Bluff City, Tenn., for 1906.

[Drainage area, 828 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	18,600	540	2,390	2.89	3.33
.....	2,070	665	946	1.14	1.19
.....	3,280	600	1,190	1.44	1.66
.....	4,160	730	1,480	1.79	2.00
.....	3,800	485	1,140	1.38	1.59
.....	1,210	340	572	.691	.77
.....	2,550	300	715	.864	1.00
.....	3,120	730	1,410	1.70	1.96
.....	2,820	485	1,060	1.28	1.43
.....	8,630	485	1,330	1.61	1.86
.....	8,130	540	1,480	1.79	2.00
.....	7,380	665	1,420	1.71	1.97
.....	18,600	300	1,260	1.52	20.76

s for 1906 are good.

HOLSTON RIVER AT AUSTINS MILLS, TENNESSEE.

tion is maintained in cooperation with the United States Bureau, by which the gage readings are furnished. It is the Southern Railway bridge at Austins Mills, near Rogers-. The conditions at this station and the bench marks are in Water-Supply Paper No. 169, page 117, where are given nces to publications that contain data for previous years.

The following discharge measurement was made October 25, 1906:

Width, 386 feet; area, 1,980 square feet; gage height, 2.98 feet; discharge, 4,600 second-feet.

Daily gage height, in feet, of Holston River at Austins Mills, Tennessee, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	4.0	2.4	3.4	2.3	1.9	2.0	4.8	4.5	2.9	2.1	[illegible]
2	2.0	3.8	2.3	3.4	2.3	1.9	1.9	3.9	3.8	2.6	2.0	[illegible]
3	1.9	3.5	2.3	3.2	2.3	1.9	1.7	3.7	3.1	2.6	2.0	[illegible]
4	3.3	3.1	2.4	3.0	2.7	1.9	1.7	3.4	3.1	2.9	1.9	[illegible]
5	4.6	3.0	2.8	2.8	3.8	1.9	1.8	3.3	3.8	3.2	1.9	[illegible]
6	3.8	3.0	2.7	2.8	4.1	1.9	1.8	3.1	5.6	3.7	1.9	[illegible]
7	3.2	2.9	2.5	3.1	5.4	2.2	1.8	2.8	4.2	3.6	1.8	[illegible]
8	2.7	2.7	2.4	3.4	5.2	2.1	1.8	2.6	4.1	3.6	1.8	[illegible]
9	2.6	2.6	2.4	3.2	4.2	2.0	1.8	2.5	3.4	3.2	1.7	[illegible]
10	2.5	2.4	2.4	3.9	3.5	2.0	1.8	2.6	3.1	2.8	1.7	[illegible]
11	2.3	2.4	2.3	3.6	3.3	1.9	2.0	2.5	2.8	2.6	1.8	[illegible]
12	2.5	2.3	2.3	3.2	3.2	1.8	1.8	2.6	2.7	2.4	2.6	[illegible]
13	2.6	2.2	2.2	3.0	2.9	2.0	1.7	2.5	2.9	2.3	3.2	[illegible]
14	3.2	2.2	2.2	2.8	2.8	1.9	1.7	3.0	2.6	2.2	2.8	[illegible]
15	3.7	2.3	3.2	2.9	2.6	2.6	1.7	3.2	2.4	2.2	2.5	[illegible]
16	3.9	2.2	4.5	5.8	2.5	2.3	1.7	4.3	2.3	2.1	2	[illegible]
17	3.7	2.4	4.6	4.7	2.5	2.5	2.5	3.5	2.2	2.0	2	[illegible]
18	3.3	2.3	3.8	3.9	2.4	2.4	2.8	4.2	2.0	2.0	2.3	[illegible]
19	3.2	2.3	3.4	3.4	2.4	2.4	2.9	3.4	2.0	2.1	7.2	[illegible]
20	3.1	2.2	3.2	3.0	2.4	2.4	2.4	3.3	3.6	6.7	11.5	[illegible]
21	2.9	2.2	3.4	2.8	2.4	2.4	2.2	3.1	2.9	6.3	7.	[illegible]
22	2.7	2.2	3.3	2.8	2.3	2.4	2.4	3.2	2.8	4.5	5.0	[illegible]
23	3.9	2.7	3.1	2.7	2.3	2.3	2.9	3.5	2.9	3.8	4.2	[illegible]
24	15.0	2.7	3.0	2.6	2.4	2.1	2.8	3.9	2.8	3.3	3.	[illegible]
25	6.2	2.5	2.9	2.5	2.1	2.1	2.5	3.8	3.0	3.0	3.	[illegible]
26	4.6	2.5	2.8	2.4	2.0	2.4	2.4	3.1	2.6	2.8	3.	[illegible]
27	4.3	2.5	3.0	2.4	2.0	2.7	2.4	2.8	2.4	2.7	3.0	[illegible]
28	4.6	2.4	3.1	2.3	2.0	2.3	3.1	2.9	2.3	2.4	2.9	[illegible]
29	4.5	.....	3.2	2.3	2.2	2.1	2.6	3.8	2.3	2.4	2.8	[illegible]
30	4.1	.....	3.2	2.4	2.2	2.0	5.2	5.1	3.5	2.3	2.6	[illegible]
31	4.0	.....	3.1	.....	2.0	.....	6.2	4.4	.....	2.2	.....	[illegible]

Rating table for Holston River at Austins Mills, Tennessee, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.70	1,700	2.60	3,660	3.50	6,100	4.40	9,120
1.80	1,900	2.70	3,900	3.60	6,410	4.50	9,490
1.90	2,100	2.80	4,150	3.70	6,720	4.60	9,860
2.00	2,310	2.90	4,410	3.80	7,040	4.70	10,240
2.10	2,520	3.00	4,670	3.90	7,370	4.80	10,620
2.20	2,740	3.10	4,940	4.00	7,710	4.90	11,010
2.30	2,960	3.20	5,220	4.10	8,050	5.00	11,400
2.40	3,190	3.30	5,510	4.20	8,400	5.20	12,200
2.50	3,420	3.40	5,800	4.30	8,760	5.40	13,000

NOTE.—The above table is applicable only for open-channel conditions. It is based on 7 discharge measurements made during 1904 to 1906. It is well defined between gage heights 1.0 foot and 6.0 feet. Above gage height 5.0 feet the rating curve is a tangent, the difference being 400 per tenth.

Monthly discharge of Holston River at Austins Mills, Tennessee, for 1906.

[Drainage area, 3,060 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	51,400	2,100	7,550	2.47	2.85
.....	7,710	2,740	3,790	1.24	1.29
.....	9,860	2,740	4,580	1.50	1.73
.....	14,600	2,960	5,180	1.69	1.89
.....	13,000	2,310	4,400	1.44	1.66
.....	3,900	1,900	2,660	.869	.97
.....	16,200	1,700	3,440	1.12	1.29
.....	11,800	3,420	5,900	1.93	2.22
.....	13,800	2,310	5,040	1.65	1.84
.....	18,200	2,310	5,060	1.65	1.90
.....	37,400	1,700	5,970	1.95	2.18
.....	18,600	2,740	4,960	1.62	1.87
'ear.....	51,400	1,700	4,880	1.59	21.69

'alues for 1906 are excellent.

WATAUGA RIVER NEAR ELIZABETHTON, TENN.

station was established May 11, 1903. It is located on the a and Southwestern Railway bridge at Siam, about 4 miles 'lizabethton, Tenn. The conditions at this station and the narks are described in Water-Supply Paper No. 169, page 119, are given also references to publications that contain data for ıs years.

The following discharge measurement was made October 22, 19(

Width, 213 feet; area, 1,060 square feet; gage height, 3.17 feet; discharge, 1, second-feet.

Dailg gage height, in feet, of Watauga River near Elizabethton, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1.65	2.6	1.85	2.8	1.7	1.5	1.7	2.4	4.1	4.2	1.9
2	1.6	2.5	1.8	2.7	1.7	1.5	1.65	2.6	3.0	4.2	1.75
3	1.6	2.3	1.8	2.6	1.7	1.5	1.6	2.5	2.7	4.5	1.7
4	3.6	2.2	2.6	2.1	2.0	1.5	1.6	2.4	3.0	4.3	1.7
5	2.8	2.1	2.6	2.0	3.0	1.45	1.55	2.35	4.0	3.2	1.7
6	2.6	2.0	2.5	2.2	3.5	1.45	1.55	2.3	3.9	2.9	1.7
7	2.4	2.0	2.4	2.2	3.4	1.4	1.5	2.0	3.7	2.7	1.65
8	2.3	2.0	2.8	2.0	3.0	1.45	1.5	1.8	3.5	2.4	1.65
9	2.0	2.0	2.6	2.0	2.9	1.45	2.2	1.7	3.4	2.2	1.6
10	1.7	2.0	2.5	1.9	2.7	1.4	1.7	1.65	3.2	2.1	1.6
11	1.7	1.95	1.9	1.9	2.5	1.4	1.5	1.6	3.0	2.0	1.75
12	1.8	1.95	1.7	1.85	2.0	3.0	1.5	1.6	2.8	1.9	2.0
13	2.0	1.9	1.7	1.8	1.9	3.5	1.45	1.8	2.4	1.9	2.0
14	2.9	1.9	1.7	1.8	1.85	3.0	1.4	2.0	2.2	1.9	1.9
15	2.6	2.1	2.6	5.0	1.8	2.8	3.0	2.3	1.9	1.9	1.75
16	2.6	2.0	3.0	3.6	1.8	2.7	2.6	2.6	1.85	1.8	1.65
17	2.5	1.9	2.4	3.4	1.7	2.7	2.4	4.2	1.8	1.8	1.6
18	2.4	1.8	2.4	3.0	1.65	2.6	2.0	2.7	1.7	1.9	2.0
19	2.2	1.8	2.3	2.5	1.6	2.4	1.8	2.6	5.0	6.0	7.0
20	2.2	1.9	2.3	2.4	1.6	2.3	2.0	2.3	4.2	5.6	4.6
21	2.1	2.4	2.2	2.2	1.55	2.0	2.3	2.3	2.7	4.0	3.4
22	7.3	2.4	2.3	2.15	1.5	1.7	2.2	2.3	3.1	3.15	2.9
23	7.4	2.1	2.4	2.1	1.5	1.65	2.0	2.3	3.0	2.7	2.6
24	4.8	2.1	2.4	2.1	1.5	2.4	1.9	2.2	2.8	2.6	2.5
25	3.6	2.0	2.35	2.0	1.45	2.55	1.85	2.2	2.5	2.4	2.4
26	3.1	2.0	2.2	1.9	1.4	2.2	1.8	2.4	2.3	2.3	2.3
27	2.9	1.9	2.1	1.8	1.8	2.0	2.9	2.6	2.15	2.2	2.15
28	2.9	1.9	2.0	1.8	1.9	1.9	2.3	4.5	2.15	2.0	2.0
29	2.8	.....	2.0	1.8	1.7	1.8	2.2	6.8	4.7	1.9	1.9
30	2.8	.....	3.4	1.75	1.6	1.7	2.1	5.4	4.3	1.85	1.7
31	2.7	.....	2.9	.....	1.55	.....	2.4	5.3	.....	1.8	.....

Rating table for Watauga River near Elizabethton, Tenn., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	205	2.40	1,010	3.60	2,330	5.60	5,200
1.30	250	2.50	1,100	3.70	2,460	5.80	5,520
1.40	300	2.60	1,190	3.80	2,590	6.00	5,840
1.50	355	2.70	1,285	3.90	2,720	6.20	6,180
1.60	410	2.80	1,385	4.00	2,850	6.40	6,520
1.70	470	2.90	1,490	4.20	3,110	6.60	6,860
1.80	535	3.00	1,600	4.40	3,390	6.80	7,200
1.90	605	3.10	1,710	4.60	3,670	7.00	7,540
2.00	680	3.20	1,825	4.80	3,970	8.00	9,340
2.10	755	3.30	1,945	5.00	4,270	9.00	11,240
2.20	835	3.40	2,070	5.20	4,570		
2.30	920	3.50	2,200	5.40	4,880		

NOTE.—The above table is based on discharge measurements made during 1904-6. It is wel between gage heights 1.4 feet and 3.7 feet.

Monthly discharge of Watauga River near Elizabethton, Tenn., for 1906.

[Drainage area, 408 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	8,260	410	1,640	4.02	4.64
.....	1,190	535	732	1.79	1.86
.....	2,070	470	959	2.35	2.71
.....	4,270	502	1,000	2.45	2.73
.....	2,200	300	728	1.78	2.05
.....	2,200	300	765	1.87	2.09
.....	1,600	300	668	1.64	1.89
.....	7,200	410	1,300	3.19	3.68
.....	4,270	470	1,750	4.29	4.79
.....	5,840	535	1,560	3.82	4.40
.....	7,540	410	1,020	2.50	2.79
.....	3,390	410	776	1.90	2.19
year.....	8,260	300	1,070	2.63	35.82

As values for 1906 are based on the only measurement made during the year they should be ir, but it is probable that good would be a better rating.

LITTLE TENNESSEE RIVER AT JUDSON, N. C.

station was established in June, 1896. It is located on the rn Railway bridge about one-fourth mile from Judson, N. C. nditions at this station and the bench marks are described in Supply Paper No. 169, page 122, where are given also refer- o publications that contain data for previous years.

scharge measurements of Little Tennessee River at Judson, N. C., in 1906.

.	Hydrographer.	Width.	Area of section.	Gage height.	Dis- charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
10...	O. P. Hall.....	147	445	3.82	1,860
.....	.....do.....	155	508	4.18	2,630
.....	.....do.....	144	378	3.30	1,480
r 5...	.....do.....	152	433	3.72	1,820
r 6...	.....do.....	152	424	3.70	1,810

Daily gage height, in feet, of Little Tennessee River at Judson, N. C., for 1906

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.75	4.5	3.7	5.1	4.0	4.6	3.4	4.7	5.1	9.4	3.85
2	3.3	4.4	3.6	4.8	4.1	4.6	3.3	4.75	5.2	7.6	3.8
3	3.55	4.2	3.75	4.55	4.1	3.65	3.3	4.45	4.1	8.0	3.8
4	4.3	4.2	3.75	4.4	4.1	3.6	4.6	5.0	4.15	8.0	3.8
5	8.0	4.2	4.2	4.3	4.1	3.65	3.9	4.5	4.25	7.0	3.75
6	6.0	4.1	3.95	4.25	3.75	3.9	4.6	4.95	4.4	7.9	3.7
7	4.7	4.0	3.8	4.15	3.2	3.5	3.95	4.55	4.4	6.9	3.65
8	4.5	4.0	3.95	4.15	3.85	3.4	3.95	4.25	4.5	6.0	3.6
9	4.6	3.9	3.9	4.0	3.75	3.3	3.8	4.0	4.25	5.7	3.6
10	4.25	3.8	3.8	5.0	3.65	3.2	3.8	4.0	4.0	5.5	3.6
11	4.1	3.8	3.7	4.75	3.2	3.2	3.65	4.0	3.9	5.2	3.8
12	4.75	3.8	3.6	4.5	3.1	3.4	3.9	4.8	4.5	5.0	3.75
13	4.4	3.8	3.6	4.2	3.6	3.8	3.8	4.85	3.2	4.9	3.5
14	4.4	3.8	3.6	4.15	3.5	5.0	6.1	4.85	3.9	4.8	3.55
15	4.3	3.7	4.8	5.0	3.35	5.3	6.3	4.25	3.8	4.7	3.6
16	4.3	3.6	5.6	5.0	3.4	5.1	6.3	5.5	3.75	4.6	3.5
17	4.4	3.55	4.6	4.9	3.35	4.6	6.3	4.0	3.6	4.5	3.6
18	4.4	3.65	4.25	4.65	3.25	4.2	6.8	4.4	3.5	4.45	5.4
19	4.1	3.65	4.45	4.65	3.3	4.0	5.0	4.5	7.1	5.5	13.5
20	4.0	3.5	6.0	4.45	3.3	3.9	3.15	4.5	6.6	4.8	7.7
21	4.0	3.5	5.1	4.15	3.3	3.75	6.2	4.75	5.8	4.6	6.1
22	4.7	3.9	5.7	4.2	3.25	3.7	5.4	4.1	5.0	4.5	5.5
23	9.0	3.6	4.45	4.1	3.2	5.5	4.2	4.1	5.0	4.4	5.1
24	7.0	3.5	4.3	4.0	3.1	4.4	4.85	5.2	4.9	4.3	4.9
25	5.9	3.6	4.3	4.0	3.15	4.3	4.25	4.4	4.75	4.25	4.7
26	5.5	3.5	4.25	3.9	3.2	4.2	4.5	4.2	4.7	4.2	4.5
27	5.4	3.55	4.2	3.85	4.7	3.75	4.5	4.2	4.6	4.1	4.4
28	5.2	3.6	4.25	4.15	3.8	4.6	4.5	4.3	4.6	4.05	4.3
29	5.0	.....	4.2	4.0	3.4	3.5	4.0	4.5	7.3	4.0	4.25
30	4.8	.....	5.1	4.0	3.4	3.5	4.5	6.2	12.0	4.0	4.2
31	4.65	.....	5.9	.....	3.3	.....	4.5	6.2	.....	3.9	.....

Rating table for Little Tennessee River at Judson, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	1,000	4.20	2,580	5.40	4,920	7.20	9,670
3.10	1,100	4.30	2,750	5.50	5,150	7.40	10,290
3.20	1,200	4.40	2,920	5.60	5,380	7.60	10,930
3.30	1,310	4.50	3,100	5.70	5,620	7.80	11,600
3.40	1,430	4.60	3,280	5.80	5,860	8.00	12,300
3.50	1,550	4.70	3,470	5.90	6,110	8.20	13,030
3.60	1,680	4.80	3,660	6.00	6,360	8.40	13,800
3.70	1,820	4.90	3,860	6.20	6,870	8.60	14,600
3.80	1,960	5.00	4,060	6.40	7,390	8.80	15,400
3.90	2,110	5.10	4,270	6.60	7,930	9.00	16,200
4.00	2,260	5.20	4,480	6.80	8,490	10.00	20,700
4.10	2,420	5.30	4,700	7.00	9,070	11.00	25,500

NOTE.—The above table is applicable only for open-channel conditions. It is based on 5 discha measurements made during 1906 and on the general form of the 1905 curve. It is well defined bet w gage heights 3.0 feet and 11.0 feet. Above gage height 10.0 feet the rating curve is a tangent, the di ence being 480 per tenth.

Monthly discharge of Little Tennessee River at Judson, N. C., for 1906

[Drainage area, 675 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	16,200	1,310	4,080	6.04	6.96
.....	3,100	1,550	2,010	2.98	3.10
.....	6,360	1,680	2,940	4.36	5.03
.....	4,270	2,030	2,900	4.30	4.80
.....	3,470	1,100	1,650	2.44	2.81
.....	5,150	1,200	2,420	3.59	4.00
.....	8,490	1,150	3,450	5.11	5.89
.....	6,870	2,260	3,380	5.01	5.78
.....	30,300	1,200	4,490	6.65	7.42
.....	18,000	2,110	5,380	7.97	9.19
.....	37,500	1,550	4,050	6.00	6.69
.....	6,360	1,000	2,650	3.93	4.53
year.....	37,500	1,000	3,280	4.86	66.20

Values for 1906 are good.

LITTLE TENNESSEE RIVER AT M'GHEE, TENN.

station was established in 1904 by the United States Weather .. It is located at the Louisville and Nashville Railroad bridge, one-third mile south of McGhee Station, Tenn. During discharge measurements have been made by the Geological , and gage-height records have been furnished by the Weather ı. The conditions at this station and the bench marks are ed in Water-Supply Paper No. 169, page 125, where are given erences to publications that contain data for previous years.

charge measurements of Little Tennessee River at McGhee, Tenn., in 1906.

.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
14...	O. P. Hall.....	464	1,330	3.84	4,910
.....	.....do.....	477	1,730	4.62	7,230
.....	.....do.....	502	2,430	5.74	11,000
1...	.....do.....	458	1,290	3.81	4,770

Daily gage height, in feet, of Little Tennessee River at McGhee, Tenn., for 190

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.8	4.8	3.7	6.2	4.0	3.3	3.8	4.9	6.1	13.3	3.[illegible]
2	3.7	4.7	3.6	5.6	4.2	4.1	3.6	5.1	5.7	8.5	3.[illegible]
3	4.0	4.5	4.0	5.2	4.1	4.3	3.5	4.9	5.2	9.3	3.[illegible]
4	12.5	4.4	6.7	4.9	4.5	3.7	3.8	5.5	4.6	9.4	3.[illegible]
5	7.6	4.3	5.0	4.7	4.2	3.9	4.4	5.5	5.1	8.0	3.[illegible]
6	6.0	4.3	4.5	4.7	4.1	3.9	3.8	5.0	5.6	7.2	3.6
7	5.2	4.2	4.2	4.9	4.5	3.8	4.4	5.0	5.3	8.7	3.6
8	4.8	4.1	4.2	4.5	4.3	3.6	5.0	4.5	5.2	7.1	3.6
9	5.6	4.0	4.3	4.6	4.0	3.4	5.3	4.3	5.0	6.3	3.6
10	4.6	3.9	4.2	7.1	3.9	3.3	4.4	4.2	6.0	5.8	3.5
11	4.4	3.7	4.1	5.6	3.8	3.3	3.9	4.1	5.1	5.5	3.6
12	4.8	3.7	4.0	5.0	3.7	3.6	4.0	3.9	5.3	5.2	4.0
13	5.0	3.9	3.9	4.8	3.7	3.7	3.9	3.9	5.1	5.1	3.6
14	4.8	3.8	3.8	4.6	3.6	5.8	3.6	4.0	4.3	4.9	3.5
15	4.7	3.8	5.5	7.7	3.5	5.5	8.2	4.8	4.2	4.8	3.5
16	4.7	3.7	7.5	6.6	3.4	7.6	6.4	4.9	3.3	4.7	3.5
17	4.5	3.6	5.5	5.6	3.4	5.6	6.0	4.5	3.2	4.5	3.5
18	4.4	3.6	5.0	5.3	3.4	4.8	9.3	4.4	3.1	4.5	4.3
19	5.0	3.6	4.8	5.0	3.4	4.9	7.7	4.9	6.7	6.2	22.2
20	4.6	3.5	7.0	4.8	3.4	4.4	6.5	4.7	7.5	5.1	20.4
21	4.4	3.5	5.9	4.7	3.4	4.1	6.5	4.9	5.9	4.9	10.0
22	4.3	4.5	5.3	4.6	3.3	4.0	8.0	4.5	5.5	4.7	8.2
23	14.0	4.0	5.0	4.4	3.3	3.9	7.7	4.4	5.3	4.5	7.1
24	9.2	3.8	4.7	4.2	3.2	4.9	6.2	4.3	5.3	4.4	6.5
25	6.9	3.7	4.8	4.2	3.2	5.5	5.5	5.0	5.0	4.3	5.9
26	6.2	3.7	4.6	4.1	3.2	5.5	5.0	4.5	4.9	4.2	5.6
27	6.2	3.7	4.8	4.1	4.0	4.7	5.2	4.5	4.6	4.1	5.4
28	5.8	4.0	5.0	4.2	4.1	4.4	5.0	5.1	4.7	4.0	5.2
29	5.5	.....	4.8	4.4	4.1	4.1	4.5	4.8	5.0	4.0	5.0
30	5.2	.....	5.8	4.1	3.7	4.0	5.2	5.7	8.9	3.9	4.8
31	5.0	.....	7.6	.....	3.5	.....	5.0	7.2	.....	3.9	.....

Rating table for Little Tennessee River at McGhee, Tenn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.10	3,200	4.40	6,500	5.70	10,320	8.00	17,520
3.20	3,420	4.50	6,780	5.80	10,620	8.20	18,180
3.30	3,650	4.60	7,060	5.90	10,920	8.40	18,840
3.40	3,890	4.70	7,350	6.00	11,220	8.60	19,500
3.50	4,130	4.80	7,640	6.20	11,840	8.80	20,160
3.60	4,380	4.90	7,930	6.40	12,460	9.00	20,820
3.70	4,630	5.00	8,220	6.60	13,080	10.00	24,220
3.80	4,890	5.10	8,520	6.80	13,700	11.00	27,720
3.90	5,150	5.20	8,820	7.00	14,320	12.00	31,320
4.00	5,410	5.30	9,120	7.20	14,960	13.00	35,020
4.10	5,680	5.40	9,420	7.40	15,600	14.00	38,820
4.20	5,950	5.50	9,720	7.60	16,240	15.00	42,620
4.30	6,220	5.60	10,020	7.80	16,880		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 11 discha measurements made during 1903 to 1906 and one made in 1901. It is well defined between gage height feet and 5.0 feet. Above gage height 13.0 feet the rating curve is a tangent, the difference being 30 tenth.

discharge of Little Tennessee River at McGhee, Tenn., for 1906.

[Drainage area, 2,470 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec. ft. per sq. mile.	Depth in inches.
.....	38,800	4,630	10,600	4.29	4.95
.....	7,640	4,130	5,340	2.16	2.25
.....	16,200	4,380	8,200	3.32	3.83
.....	16,600	5,680	8,320	3.37	3.76
.....	6,780	3,420	4,780	1.94	2.24
.....	16,200	3,650	6,570	2.66	2.97
.....	21,800	4,130	9,380	3.80	4.38
.....	15,000	5,150	7,590	3.07	3.54
.....	20,500	3,200	9,010	3.65	4.07
.....	36,200	5,150	11,000	4.45	5.13
.....	70,000	4,130	11,300	4.57	5.10
.....	16,900	5,150	8,140	3.30	3.80
.....	70,000	3,200	8,350	3.38	46.02

r 1906 are excellent.

TUCKASEGEE RIVER AT BRYSON, N. C.

n was originally established in June, 1896, at the South-bridge about 3 miles above Bryson, N. C., just below and post-office, but was abandoned March 25, 1897, on he poor section. The present station was established 1897, at the highway bridge in the town of Bryson, N. C. ns at this station and the bench marks are described in y Paper No. 169, page 128, where are given also refer-ications that contain data for previous years.

e measurements of Tuckasegee River at Bryson, N. C., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
P. Hall.....	190	951	1.78	1,370
..do.....	190	1,130	2.67	2,830
..do.....	190	888	1.63	1,180
..do.....	190	866	1.68	1,230

Daily gage height, in feet, of Little Tennessee River at McGhee, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.8	4.8	3.7	6.2	4.0	3.3	3.8	4.9	6.1	13.3	3.8
2	3.7	4.7	3.6	5.6	4.2	4.1	3.6	5.1	5.7	8.5	3.8
3	4.0	4.5	4.0	5.2	4.1	4.3	3.5	4.9	5.2	9.3	3.8
4	12.5	4.4	6.7	4.9	4.5	3.7	3.8	5.5	4.6	9.4	3.7
5	7.6	4.3	5.0	4.7	4.2	3.9	4.4	5.5	5.1	8.0	3.6
6	6.0	4.3	4.5	4.7	4.1	3.9	3.8	5.0	5.6	7.2	3.6
7	5.2	4.2	4.2	4.9	4.5	3.8	4.4	5.0	5.3	8.7	3.6
8	4.8	4.1	4.2	4.5	4.3	3.6	5.0	4.5	5.2	7.1	3.6
9	5.6	4.0	4.3	4.6	4.0	3.4	5.3	4.3	5.0	6.3	3.6
10	4.6	3.9	4.2	7.1	3.9	3.3	4.4	4.2	6.0	5.8	3.5
11	4.4	3.7	4.1	5.6	3.8	3.3	3.9	4.1	5.1	5.5	3.6
12	4.8	3.7	4.0	5.0	3.7	3.6	4.0	3.9	5.3	5.2	4.0
13	5.0	3.9	3.9	4.8	3.7	3.7	3.9	3.9	5.1	5.1	3.6
14	4.8	3.8	3.8	4.6	3.6	5.8	3.6	4.0	4.3	4.9	3.5
15	4.7	3.8	5.5	7.7	3.5	5.5	8.2	4.8	4.2	4.8	3.5
16	4.7	3.7	7.5	6.6	3.4	7.6	6.4	4.9	3.3	4.7	3.5
17	4.5	3.6	5.5	5.6	3.4	5.6	6.0	4.5	3.2	4.5	3.5
18	4.4	3.6	5.0	5.3	3.4	4.8	9.3	4.4	3.1	4.5	4.3
19	5.0	3.6	4.8	5.0	3.4	4.9	7.7	4.9	6.7	6.2	22.2
20	4.6	3.5	7.0	4.8	3.4	4.4	6.5	4.7	7.5	5.1	20.4
21	4.4	3.5	5.9	4.7	3.4	4.1	6.5	4.9	5.9	4.9	10.0
22	4.3	4.5	5.3	4.6	3.3	4.0	8.0	4.5	5.5	4.7	8.2
23	14.0	4.0	5.0	4.4	3.3	3.9	7.7	4.4	5.3	4.5	7.1
24	9.2	3.8	4.7	4.2	3.2	4.9	6.2	4.3	5.3	4.4	6.5
25	6.9	3.7	4.8	4.2	3.2	5.5	5.5	5.0	5.0	4.3	5.9
26	6.2	3.7	4.6	4.1	3.2	5.5	5.0	4.5	4.9	4.2	5.6
27	6.2	3.7	4.8	4.1	4.0	4.7	5.2	4.5	4.6	4.1	5.4
28	5.8	4.0	5.0	4.2	4.1	4.4	5.0	5.1	4.7	4.0	5.2
29	5.5	.....	4.8	4.4	4.1	4.1	4.5	4.8	5.0	4.0	5.0
30	5.2	.....	5.8	4.1	3.7	4.0	5.2	5.7	8.9	3.9	4.8
31	5.0	.....	7.6	.....	3.5	.....	5.0	7.2	.....	3.9	.....

Rating table for Little Tennessee River at McGhee, Tenn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.10	3,200	4.40	6,500	5.70	10,320	8.00	17,520
3.20	3,420	4.50	6,780	5.80	10,620	8.20	18,180
3.30	3,650	4.60	7,060	5.90	10,920	8.40	18,840
3.40	3,890	4.70	7,350	6.00	11,220	8.60	19,500
3.50	4,130	4.80	7,640	6.20	..,840	8.80	20,160
3.60	4,380	4.90	7,930	6.40	12,460	9.00	20,820
3.70	4,630	5.00	8,220	6.60	13,080	10.00	24,220
3.80	4,890	5.10	8,520	6.80	13,700	11.00	27,720
3.90	5,150	5.20	8,820	7.00	14,320	12.00	31,320
4.00	5,410	5.30	9,120	7.20	14,960	13.00	35,020
4.10	5,680	5.40	9,420	7.40	15,600	14.00	38,820
4.20	5,950	5.50	9,720	7.60	16,240	15.00	42,620
4.30	6,220	5.60	10,020	7.80	16,880		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 11 discharge measurements made during 1903 to 1906 and one made in 1901. It is well defined between gage heights 3.1 feet and 5.0 feet. Above gage height 13.0 feet the rating curve is a tangent, the difference being 30 p tenth.

thly discharge of Little Tennessee River at McGhee, Tenn., for 1906.

[Drainage area, 2,470 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec. ft. per sq. mile.	Depth in inches.
.....	38,800	4,630	10,600	4.29	4.95
.....	7,640	4,130	5,340	2.16	2.25
.....	16,200	4,380	8,200	3.32	3.83
.....	16,600	5,680	8,320	3.37	3.76
.....	6,780	3,420	4,780	1.94	2.24
.....	16,200	3,650	6,570	2.66	2.97
.....	21,800	4,130	9,380	3.80	4.38
.....	15,000	5,150	7,590	3.07	3.54
.....	20,500	3,200	9,010	3.65	4.07
.....	36,200	5,150	11,000	4.45	5.13
.....	70,000	4,130	11,300	4.57	5.10
.....	16,900	5,150	8,140	3.30	3.80
.....	70,000	3,200	8,350	3.38	46.02

es for 1906 are excellent.

TUCKASEGEE RIVER AT BRYSON, N. C.

tion was originally established in June, 1896, at the South-ay bridge about 3 miles above Bryson, N. C., just below Island post-office, but was abandoned March 25, 1897, on f the poor section. The present station was established · 7, 1897, at the highway bridge in the town of Bryson, N. C. tions at this station and the bench marks are described in pply Paper No. 169, page 128, where are given also refer-ublications that contain data for previous years.

harge measurements of Tuckasegee River at Bryson, N. C., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
O. P. Hall.....	190	951	1.78	1,370
.....do.....	190	1,130	2.67	2,830
.....do.....	190	888	1.63	1,180
.....do.....	190	866	1.68	1,230

Daily gage height, in feet, of Tuckasegee River at Bryson, N. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	1.6	2.2	1.6	2.7	2.0	1.55	1.65	2.2	2.5	3.8	1.75	
2	1.6	2.15	1.6	2.45	1.9	2.5	1.6	2.4	2.25	4.8	1.75	
3	5.5	2.0	3.6	2.3	2.1	1.5	2.0	2.3	2.4	4.6	1.7	
4	3.6	1.95	2.3	2.2	2.0	1.7	2.1	2.2	2.4	3.9	1.7	
5	2.9	2.0	2.0	2.15	1.9	1.9	1.8	2.0	3.2	3.5	1.7	
6	2.5	1.95	1.9	2.3	2.0	1.9	2.1	2.1	2.6	4.2	1.7	
7	2.3	1.9	1.85	2.1	2.0	1.7	1.9	2.0	2.4	3.4	1.65	
8	2.2	1.85	2.0	2.05	1.9	1.6	2.0	1.9	2.2	3.1	1.65	
9	2.05	1.8	1.9	2.5	1.8	1.6	1.9	1.7	2.1	2.9	1.6	
10	1.9	1.8	1.8	2.4	1.7	1.7	1.65	1.7	2.0	2.7	1.6	
11	1.9	1.75	1.75	2.25	1.7	1.7	1.65	1.7	1.9	2.5	1.9	
12	2.1	1.85	1.7	2.15	1.7	1.65	1.6	1.65	2.0	2.4	1.7	
13	2.0	1.8	1.7	2.1	1.7	3.7	1.6	1.6	2.0	2.45	1.7	
14	2.1	1.8	1.9	3.75	1.65	2.2	2.4	1.9	1.8	2.3	1.7	
15	2.0	1.75	3.45	3.3	1.6	3.6	2.6	2.2	1.8	2.2	1.6	
16	2.1	1.7	2.5	2.8	1.6	2.5	2.2	2.0	1.75	2.2	1.6	
17	1.9	1.65	2.2	2.6	1.6	2.2	2.7	2.0	1.7	2.15	1.75	
18	2.3	1.65	2.1	2.4	1.55	2.0	3.35	2.4	4.2	3.0	5.0	
19	2.0	1.65	2.5	2.3	1.55	2.0	2.7	2.1	4.6	2.4	10.0	
20	2.0	1.6	2.7	2.2	1.5	1.9	2.4	2.0	3.1	2.35	4.2	
21	2.0	2.0	2.4	2.2	1.5	1.8	2.5	2.1	2.7	2.2	3.4	
22	4.3	1.8	2.3	2.1	1.55	1.8	2.7	2.0	2.6	2.1	2.9	
23	5.0	1.7	2.15	2.0	1.5	1.75	2.5	2.0	2.8	2.0	2.8	
24	3.4	1.7	2.2	2.0	1.45	2.6	2.5	2.3	2.5	2.0	2.5	
25	3.0	1.65	2.1	1.95	1.4	2.2	2.2	2.0	2.4	1.9	2.4	
26	3.1	1.6	2.0	1.9	1.5	1.9	2.1	2.0	2.25	1.9	2.25	
27	2.75	1.85	2.4	1.9	2.0	1.9	2.0	2.1	2.3	1.85	2.2	
28	2.6	1.6	2.2	1.9	2.4	1.8	2.0	2.3	2.4	1.8	2.1	
29	2.5	.....	2.5	1.9	1.9	1.8	2.1	2.7	4.4	1.8	2.0	
30	2.4	.....	4.2	1.85	1.7	1.7	2.1	3.6	6.2	1.8	2.0	
31	2.3	.....	3.0	.....	1.6	.....	2.0	2.8	.....	1.8	.....	

Rating table for Tuckasegee River at Bryson, N. C., 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	380	2.00	1,660	3.10	3,670	4.40	6,920
1.00	460	2.10	1,810	3.20	3,890	4.60	7,530
1.10	550	2.20	1,970	3.30	4,110	4.80	8,160
1.20	650	2.30	2,130	3.40	4,330	5.00	8,800
1.30	750	2.40	2,300	3.50	560	5.20	9,475
1.40	860	2.50	2,480	3.60	4,800	5.40	10,250
1.50	980	2.60	2,660	3.70	5,040	5.60	11,125
1.60	1,100	2.70	2,850	3.80	5,290	5.80	12,100
1.70	1,230	2.80	3,050	3.90	5,540	6.00	13,200
1.80	1,370	2.90	3,250	4.00	5,800	6.20	14,360
1.90	1,510	3.00	3,460	4.20	6,350	6.40	15,520

NOTE.—The above table is based on discharge measurements made during 1904 to 1906. It is we defined to gage height 3 feet. Above gage height 6.0 feet the rating curve is a tangent, the differen being 580 per tenth.

Monthly discharge of Tuckasegee River at Bryson, N. C., for 1906.

[Drainage area, 662 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	10,700	1,100	2,870	4.34	5.00
.....	1,970	1,100	1,390	2.10	2.19
.....	6,350	1,100	2,190	3.31	3.82
.....	5,160	1,440	2,170	3.28	3.66
.....	2,300	860	1,300	1.96	2.26
.....	5,040	980	1,750	2.64	2.94
.....	4,220	1,100	1,930	2.92	3.37
.....	4,800	1,100	1,900	2.87	3.31
.....	14,400	1,230	3,070	4.64	5.18
.....	8,160	1,370	2,960	4.47	5.15
.....	36,400	1,100	3,230	4.88	5.44
.....	5,800	1,370	2,040	3.08	3.55
r.....	36,400	860	2,230	3.37	45.87

ues for 1906 are excellent.

HIWASSEE RIVER AT MURPHY, N. C.

tation was established July 26, 1896. It is located at the bridge, Murphy, N. C., about 80 feet above the Louisville ıville Railroad bridge and one-half mile above the mouth of .iver. The conditions at this station and the bench marks ribed in Water-Supply Paper No. 169, page 130, where are so references to publications that contain data for previous

scharge measurements of Hiwassee River at Murphy, N. C., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
O. P. Hall.....	169	425	5.78	902
.....do.....	172	473	6.17	1,310
M. R. Hall.....	172	471	6.17	1,400
.....do.....	176	559	6.68	2,060
O. P. Hall.....	170	426	5.61	847
.....do.....	170	414	5.63	799

Daily gage height, in feet, of Hiwassee River at Murphy, N. C., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	5.6	6.1	5.5	6.7	5.75	5.4	5.4	6.4	6.65	9.0	5.7
2	5.6	6.05	5.5	6.45	5.75	6.7	5.4	6.4	6.3	7.6	5.7
3	5.85	5.95	5.65	6.25	5.75	5.65	5.4	6.2	6.15	7.8	5.7
4	8.2	5.9	6.15	6.15	5.85	5.8	5.65	6.3	6.1	7.8	5.65
5	6.9	5.9	5.9	6.1	5.75	5.85	5.4	6.1	6.1	7.2	5.65
6	6.45	5.85	5.75	6.05	5.7	5.8	5.4	6.0	5.95	7.4	5.65
7	6.25	5.85	5.7	6.0	6.15	5.6	5.5	6.25	5.9	7.2	5.65
8	6.1	5.8	5.9	5.95	5.85	5.5	5.35	5.9	6.4	6.85	5.6
9	6.05	5.8	5.8	5.95	5.7	5.5	5.75	5.8	5.85	6.6	5.6
10	6.2	5.75	5.75	6.55	5.7	5.4	5.4	5.7	5.85	6.5	5.6
11	5.9	5.7	5.7	6.25	5.65	5.4	5.4	5.65	5.75	6.35	5.6
12	6.3	5.7	5.65	6.1	5.65	5.55	5.45	5.6	6.7	6.25	5.75
13	6.05	5.7	5.65	6.05	5.65	5.75	5.4	5.6	5.9	6.15	5.6
14	6.05	5.65	5.65	6.0	5.6	6.2	5.35	6.3	5.7	6.1	5.6
15	5.95	5.65	7.6	7.4	5.55	6.15	6.9	7.4	5.7	6.05	5.55
16	5.95	5.65	6.95	6.75	5.5	6.55	6.45	6.25	5.65	6.0	5.6
17	5.85	5.6	6.4	6.45	5.5	6.1	8.2	5.9	5.6	6.0	5.65
18	5.95	5.6	6.2	6.25	5.5	5.85	6.45	5.95	5.05	5.95	6.6
19	5.95	5.55	6.2	6.15	5.45	5.75	5.95	6.0	7.0	6.5	15.8
20	5.85	5.55	7.2	6.05	5.45	5.7	6.4	6.25	6.35	6.2	8.2
21	5.85	5.65	6.65	6.0	5.4	5.55	6.45	6.1	6.25	6.1	7.2
22	5.95	5.7	6.4	5.95	5.45	5.1	6.3	6.2	6.3	6.05	6.95
23	9.5	5.6	6.25	5.9	5.4	5.45	6.2	5.95	6.25	6.0	6.6
24	7.5	5.6	6.1	5.85	5.35	6.2	6.05	6.1	6.3	5.95	6.45
25	6.6	5.6	6.1	5.8	5.35	5.95	5.85	6.0	6.15	5.9	6.3
26	6.7	5.55	6.1	5.8	5.45	6.0	6.05	5.8	6.1	5.85	6.25
27	6.65	5.55	6.1	5.8	6.25	5.65	5.85	6.05	6.05	5.8	6.2
28	6.25	5.5	6.05	6.85	5.65	5.55	5.75	5.8	5.95	5.75	6.15
29	6.35	.....	6.05	5.9	5.55	5.6	5.7	6.4	7.1	5.75	6.1
30	6.25	.....	6.5	5.85	5.45	5.5	6.3	8.7	9.6	5.75	6.05
31	6.2	.....	7.2	.....	5.4	.....	5.85	7.4	.....	5.75	.....

Rating table for Hiwassee River at Murphy, N. C., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
5.00	310	5.90	1,010	6.80	2,370	7.70	4,180
5.10	365	6.00	1,130	6.90	2,550	7.80	4,400
5.20	425	6.10	1,260	7.00	2,740	7.90	4,620
5.30	490	6.20	1,400	7.10	2,930	8.00	4,840
5.40	560	6.30	1,540	7.20	3,130	8.20	5,280
5.50	635	6.40	1,690	7.30	3,330	8.40	5,720
5.60	715	6.50	1,850	7.40	3,540		
5.70	800	6.60	2,020	7.50	3,750		
5.80	900	6.70	2,190	7.60	3,960		

NOTE.—The above table is applicable only for open-channel conditions. It is based on disch measurements made during 1900 to 1906. It is well defined between gage heights 5.0 feet and 6.5 Above gage height 8.0 feet the rating curve is a tangent, the difference being 220 per tenth.

Monthly discharge of Hiwassee River at Murphy, N. C., for 1906.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	8,140	715	1,760	4.29	4.95
.....	1,260	635	830	2.02	2.10
.....	3,960	635	1,410	3.44	3.97
.....	3,540	900	1,410	3.44	3.84
.....	1,470	525	749	1.83	2.11
.....	2,190	365	912	2.22	2.48
.....	5,280	560	1,150	2.80	3.23
.....	6,380	715	1,520	3.71	4.28
.....	8,360	338	1,570	3.83	4.27
.....	7,040	850	1,950	4.76	5.49
.....	22,000	715	1,990	4.85	5.41
.....	4,400	1,010	1,630	3.98	4.59
ear.....	22,000	338	1,410	3.43	46.72

alues for 1906 are excellent.

HIWASSEE RIVER AT RELIANCE, TENN.

station was established August 17, 1900. It is located at the le and Nashville Railroad bridge at Reliance, Tenn. The ns at this station and the bench marks are described in Supply Paper No. 169, page 132, where are given also ref- to publications that contain data for previous years.

Discharge measurements of Hiwassee River at Reliance, Tenn., in 1906.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
3...	O. P. Hall.....	317	1,990	1.88	2,090
...	....do.....	326	2,210	2.27	3,000
...	....do.....	330	2,270	2.38	3,440
2...	....do.....	319	2,040	1.92	2,240

Daily gage height, in feet, of Hiwassee River at Reliance, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1.85	2.35	1.7	3.1	2.05	1.5	1.7	2.9	3.0	5.4	1.95
2	1.8	2.25	1.7	2.25	2.0	1.75	1.6	3.1	2.6	3.9	1.95
3	1.95	2.2	2.1	2.5	1.95	2.0	1.6	2.85	2.4	4.5	1.9
4	6.3	2.1	2.8	2.4	2.1	1.8	1.75	2.75	2.35	4.2	1.9
5	3.6	2.05	2.3	2.3	2.0	1.9	1.75	2.5	2.25	4.2	1.9
6	2.9	2.05	2.1	2.2	1.95	2.15	1.6	2.3	2.65	3.4	1.9
7	2.5	2.0	2.0	2.15	2.0	1.9	1.55	2.7	2.25	4.0	1.85
8	2.3	2.0	2.05	2.2	2.05	1.75	1.65	2.3	2.25	3.4	1.85
9	2.7	1.95	2.15	2.5	1.95	1.65	1.65	2.15	2.25	3.0	1.8
10	2.35	1.9	2.0	3.4	1.9	1.5	1.75	2.0	2.25	2.8	1.8
11	2.2	1.85	1.9	2.45	1.85	1.5	1.55	1.95	2.2	2.35	1.85
12	2.3	1.85	1.85	2.5	1.8	1.5	1.65	1.9	2.65	2.25	2.0
13	2.35	1.9	1.85	2.3	1.8	2.05	1.65	1.85	2.25	2.0	1.85
14	2.3	1.85	1.85	2.25	1.75	2.8	2.3	1.85	2.15	2.4	1.8
15	2.2	1.85	3.0	3.65	1.7	2.5	5.0	2.25	2.0	2.3	1.85
16	2.2	1.8	3.6	3.1	1.65	3.6	3.2	2.3	1.95	2.3	1.85
17	2.15	1.75	2.85	2.6	1.65	2.7	2.9	2.0	1.85	2.25	1.9
18	2.1	1.75	2.45	2.5	1.6	2.3	5.4	2.0	1.85	2.4	2.7
19	2.35	1.75	2.45	2.4	1.6	2.1	3.7	2.0	3.5	3.4	15.2
20	2.15	1.7	4.0	2.2	1.55	2.0	3.1	2.35	2.9	2.35	7.0
21	2.05	1.8	3.2	2.25	1.55	1.9	3.0	2.6	2.5	2.4	4.1
22	2.4	2.0	2.6	2.2	1.55	1.8	4.1	2.15	2.85	2.3	3.5
23	6.9	1.85	2.5	2.1	1.55	1.7	3.3	2.3	2.55	2.25	3.1
24	4.0	1.8	2.4	2.05	1.5	1.75	2.75	2.25	2.85	2.2	2.9
25	3.2	1.75	2.35	2.0	1.45	2.5	2.5	2.3	2.5	2.2	2.7
26	2.25	1.75	2.35	2.0	1.6	2.2	2.4	2.25	2.4	2.15	2.6
27	2.9	1.8	2.2	2.1	2.4	2.0	2.4	2.0	2.25	2.1	2.5
28	2.7	1.8	2.2	2.2	1.9	1.9	2.1	2.1	2.25	2.0	2.4
29	2.6	.....	2.3	2.3	1.75	1.85	2.0	2.05	2.25	2.05	2.35
30	2.5	.....	2.9	2.05	1.65	1.7	2.4	3.8	5.2	2.0	2.3
31	2.4	.....	3.2	.....	1.55	.....	2.35	3.9	.....	2.0	.....

Rating table for Hiwassee River at Reliance, Tenn., 1904 to 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.70	380	1.70	1,725	2.60	4,090	3.50	7,300
0.80	460	1.80	1,940	2.70	4,410	3.60	7,690
0.90	550	1.90	2,165	2.80	4,745	3.70	8,080
1.00	655	2.00	2,400	2.90	5,090	3.80	8,475
1.10	770	2.10	2,650	3.00	5,445	3.90	8,875
1.20	895	2.20	2,915	3.10	5,805	4.00	9,280
1.30	1,030	2.30	3,190	3.20	6,170	4.20	10,090
1.40	1,180	2.40	3,480	3.30	6,540	4.40	10,910
1.50	1,345	2.50	3,780	3.40	6,915	4.60	11,730
1.60	1,525						

NOTE.—The above table is based on 12 discharge measurements made during 1904–5 and 1 measurement made in 1901. It is well defined between gage heights 0.7 foot and 2.3 feet. Above gage height 4.2 feet the rating curve is a tangent, the difference being 410 per tenth.

Rating tables for Valley River at Tomotla, N. C.

JANUARY 1 TO DECEMBER 31, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	50	1.90	230	2.80	530	3.70	960
1.10	66	2.00	260	2.90	570	3.80	1,015
1.20	82	2.10	290	3.00	610	3.90	1,075
1.30	100	2.20	320	3.10	655	4.00	1,135
1.40	118	2.30	350	3.20	700	4.20	1,260
1.50	138	2.40	380	3.30	750	4.40	1,390
1.60	158	2.50	415	3.40	800	4.60	1,520
1.70	180	2.60	450	3.50	850	4.80	1,660
1.80	205	2.70	490	3.60	905	5.00	1,800

JANUARY 1 TO DECEMBER 31, 1906.[b]

1.20	92	2.10	315	3.00	635	3.80	1,040
1.30	112	2.20	345	3.10	680	3.90	1,100
1.40	134	2.30	375	3.20	725	4.00	1,160
1.50	156	2.40	405	3.30	775	4.20	1,285
1.60	180	2.50	440	3.40	825	4.40	1,415
1.70	205	2.60	475	3.50	875	4.60	1,545
1.80	230	2.70	515	3.60	930	4.80	1,680
1.90	255	2.80	555	3.70	985	5.00	1,820
2.00	285	2.90	595				

ble is applicable only for open-channel conditions. It is based on four discharge measure-
e during 1905. It is well defined between gage heights 1.0 feet and 2.0 foot. Above gage height
rating curve is a tangent, the difference being 70 per tenth.

ble is applicable only for open-channel conditions. It is based on five discharge measure-
e during 1906. It is well defined between gage heights 1.2 feet and 3.0 feet. Above gage height
rating curve is a tangent, the difference being 70 per tenth.

fonthly discharge of Valley River at Tomotla, N. C., for 1905 and 1906.

[Drainage area, 106 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
.....	3,550	66	302	2.85	3.29
.....	3,830	100	766	7.23	7.53
.....	800	205	314	2.96	3.41
.....	678	192	265	2.50	2.79
.....	678	192	282	2.66	3.07
.....	550	91	154	1.45	1.62
.....	5,020	138	420	3.96	4.56
.....	700	100	222	2.09	2.41
.....	138	50	86.4	.815	.91
.....	432	58	102	.962	1.11
.....	192	58	85.2	.804	.90
.....	3,720	128	559	5.27	6.08
year.....	5,020	50	296	2.80	37.68
1906.					
.....	2,240	242	574	5.42	6.25
.....	360	192	250	2.36	2.46
.....	1,040	242	446	4.21	4.85
.....	1,540	285	419	3.95	4.41
.....	375	134	204	1.92	2.21
.....	1,420	102	325	3.07	3.42
.....	1,080	156	434	4.09	4.72
.....	725	217	325	3.07	3.54
.....	1,820	156	393	3.71	4.14
.....	2,520	205	483	4.56	5.26
.....	10,400	156	803	7.58	8.46
.....	1,220	285	562	5.30	6.11
year.....	10,400	102	435	4.10	55.83

Values for 1905 and 1906 can be considered only fair, owing to discrepancies between the gage probably due to daily fluctuations from stored water.

OKOEE RIVER AT M'CAYS, TENN.

This station was established March 21, 1903. It is located at a suspension footbridge just below McCay's ferry at McCays, Tenn., near the Georgia-Tennessee boundary, and one-half mile below the railroad bridge of the Louisville and Nashville Railroad. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 138, where are given also references to publications that contain data for previous years.

Discharge measurements of Okoee River at McCays, Tenn., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
February 12	O. P. Hall	153	544	1.63	92
April 18	do	156	616	1.98	1.130
June 11	do	152	501	1.33	73
November 3	do	153	525	1.57	90

Daily gage height, in feet, of Okoee River at McCays, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.4	2.1	1.5	2.75	1.8	1.4	1.3	2.3	2.1	3.25	1.6	1.9
2	1.3	2.0	1.5	2.4	1.75	2.45	1.35	2.35	2.0	3.75	1.6	1.9
3	4.4	1.9	2.7	2.1	1.9	1.65	1.6	2.1	1.9	3.5	1.6	1.9
4	4.4	1.9	2.45	2.1	2.05	1.55	1.5	2.05	1.85	3.1	1.55	1.8
5	2.8	1.9	1.8	2.0	1.75	1.75	1.35	1.85	2.2	2.75	1.5	1.85
6	2.4	1.8	1.6	2.0	1.7	1.55	1.3	2.2	2.05	3.7	1.5	1.86
7	2.05	1.8	1.6	1.9	1.65	1.4	1.5	1.85	1.9	3.05	1.5	1.9
8	2.0	1.7	1.8	1.9	1.8	1.35	1.55	1.85	1.9	2.75	1.5	1.7
9	2.0	1.7	1.7	2.6	1.7	1.4	1.7	1.8	1.8	2.5	1.45	1.7
10	1.95	1.6	1.6	2.2	1.65	1.35	1.4	1.7	2.4	2.4	1.4	2.85
11	1.9	1.5	1.6	2.0	1.65	1.45	1.35	1.7	1.9	2.3	1.6	2.5
12	2.0	1.6	1.5	2.0	1.6	1.4	1.5	1.65	2.1	2.2	1.5	2.2
13	1.95	1.6	1.5	1.9	1.6	4.0	1.3	2.3	1.8	2.2	1.5	2.05
14	1.9	1.6	1.65	2.2	1.5	2.65	4.3	2.3	1.75	2.1	1.5	1.85
15	1.8	1.5	4.8	2.7	1.5	3.8	2.85	2.2	1.65	2.0	1.5	1.8
16	1.85	1.5	2.6	2.1	1.45	2.15	2.15	2.1	1.6	2.0	1.5	1.8
17	1.7	1.5	2.15	2.05	1.45	1.8	3.8	1.65	1.5	2.0	1.6	2.05
18	1.8	1.4	2.15	1.9	1.4	1.85	4.4	1.8	1.5	2.45	7.0	2.1
19	1.7	1.45	3.6	1.9	1.4	1.7	2.95	1.95	3.4	2.3	18.5	2.05
20	1.65	1.45	3.4	1.9	1.4	1.65	2.65	2.15	2.3	2.0	8.0	2.5
21	1.65	1.9	2.7	1.8	1.35	1.5	2.55	1.9	1.95	1.9	3.2	2.1
22	3.8	1.65	2.45	1.8	1.35	1.45	3.3	1.9	2.05	1.9	2.95	1.95
23	6.5	1.5	2.25	1.8	1.3	1.4	3.6	2.15	2.05	1.85	2.55	1.95
24	3.2	1.5	2.1	1.7	1.3	3.8	2.3	2.05	2.3	1.8	2.4	1.9
25	2.8	1.5	2.05	1.7	1.2	1.8	2.1	1.95	2.0	1.8	2.3	1.8
26	2.7	1.4	2.05	1.65	2.0	1.65	2.55	1.8	1.9	1.8	2.2	1.8
27	2.8	1.35	2.1	2.0	1.9	1.5	2.15	1.7	1.8	1.7	2.2	1.7
28	2.4	1.4	2.1	2.9	1.5	1.5	2.0	1.7	1.8	1.7	2.1	2.2
29	2.4	.....	2.25	2.0	1.4	1.5	2.35	3.6	3.1	1.6	2.0	2.25
30	2.3	.....	3.0	1.9	1.3	1.4	2.55	3.3	4.6	1.6	1.9	2.1
31	2.2	.....	2.8	.....	1.3	.....	2.2	2.5	.....	1.6	.....	4.4

OKOEE RIVER NEAR DUCKTOWN, TENN.

OKOEE RIVER AT M'CAYS, TENN.

This station was established March 21, 1903. It is loca suspension footbridge just below McCay's ferry at McCays near the Georgia-Tennessee boundary, and one-half mile b railroad bridge of the Louisville and Nashville Railroad. The tions at this station and the bench marks are described in Wa Supply Paper No. 169, page 138, where are given also references publications that contain data for previous years.

Discharge measurements of Okoee River at McCays, Tenn., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Di char
		Feet.	*Sq. ft.*	*Feet.*	*Sec.*
February 12	O. P. Hall	153	544	1.63	
April 18	do	156	616	1.98	1
June 11	do	152	501	1.33	
November 3	do	153	525	1.57	

Daily gage height, in feet, of Okoee River at McCays, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	I
1	1.4	2.1	1.5	2.75	1.8	1.4	1.3	2.3	2.1	3.25	1.6	
2	1.3	2.0	1.5	2.4	1.75	2.45	1.35	2.35	2.0	3.75	1.6	
3	4.4	1.9	2.7	2.1	1.9	1.65	1.6	2.1	1.9	3.5	1.6	
4	4.4	1.9	2.45	2.1	2.05	1.55	1.5	2.05	1.85	3.1	1.55	
5	2.8	1.9	1.8	2.0	1.75	1.75	1.35	1.85	2.2	2.75	1.5	
6	2.4	1.8	1.6	2.0	1.7	1.55	1.3	2.2	2.05	3.7	1.5	
7	2.05	1.8	1.6	1.9	1.65	1.4	1.5	1.85	1.9	3.05	1.5	
8	2.0	1.7	1.8	1.9	1.8	1.35	1.55	1.85	1.9	2.75	1.5	
9	2.0	1.7	1.7	2.6	1.7	1.4	1.7	1.8	1.8	2.5	1.45	
10	1.95	1.6	1.6	2.2	1.65	1.35	1.4	1.7	2.4	2.4	1.4	
11	1.9	1.5	1.6	2.0	1.65	1.45	1.35	1.7	1.9	2.3	1.6	
12	2.0	1.6	1.5	2.0	1.6	1.4	1.5	1.65	2.1	2.2	1.5	
13	1.95	1.6	1.5	1.9	1.6	4.0	1.3	2.3	1.8	2.2	1.5	
14	1.9	1.6	1.65	2.2	1.5	2.65	4.3	2.3	1.75	2.1	1.5	
15	1.8	1.5	4.8	2.7	1.5	3.8	2.85	2.2	1.65	2.0	1.5	
16	1.85	1.5	2.6	2.1	1.45	2.15	2.15	2.1	1.6	2.0	1.5	
17	1.7	1.5	2.15	2.05	1.45	1.8	3.8	1.65	1.5	2.0	1.6	
18	1.8	1.4	2.15	1.9	1.4	1.85	4.4	1.8	1.5	2.45	7.0	
19	1.7	1.45	3.6	1.9	1.4	1.7	2.95	1.95	3.4	2.3	18.5	
20	1.65	1.45	3.4	1.9	1.4	1.65	2.65	2.15	2.3	2.0	8.0	
21	1.65	1.9	2.7	1.8	1.35	1.5	2.55	1.9	1.95	1.9	3.2	
22	3.8	1.65	2.45	1.8	1.35	1.45	3.3	1.9	2.05	1.9	2.95	
23	6.5	1.5	2.25	1.8	1.3	1.4	3.6	2.15	2.05	1.85	2.55	
24	3.2	1.5	2.1	1.7	1.3	3.8	2.3	2.05	2.3	1.8	2.4	
25	2.8	1.5	2.05	1.7	1.2	1.8	2.1	1.95	2.0	1.8	2.3	
26	2.7	1.4	2.05	1.65	2.0	1.65	2.55	1.8	1.9	1.8	2.2	
27	2.8	1.55	2.1	2.0	1.9	1.5	2.15	1.7	1.8	1.7	2.2	
28	2.4	1.4	2.1	2.9	1.5	1.5	2.0	1.7	1.8	1.7	2.1	
29	2.4	.....	2.25	2.0	1.4	1.5	2.35	3.6	3.1	1.6	2.0	
30	2.3	.....	3.0	1.9	1.3	1.4	2.55	3.3	4.6	1.6	1.9	
31	2.2	.....	2.8	.....	1.3	.....	2.2	2.5	.....	1.6	.....	

OKOEE RIVER NEAR DUCKTOWN, TENN.

[redacted]

Rating table for Okoee River at McCays, Tenn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	640	2.30	1,315	3.40	2,075	5.00	3,360
1.30	695	2.40	1,380	3.50	2,150	5.20	3,540
1.40	750	2.50	1,445	3.60	2,225	5.40	3,730
1.50	810	2.60	1,510	3.70	2,300	5.60	3,930
1.60	870	2.70	1,580	3.80	2,375	5.80	4,130
1.70	930	2.80	1,650	3.90	2,450	6.00	4,330
1.80	990	2.90	1,720	4.00	2,530	6.20	4,530
1.90	1,055	3.00	1,790	4.20	2,690	6.40	4,740
2.00	1,120	3.10	1,860	4.40	2,850	6.60	4,960
2.10	1,185	3.20	1,930	4.60	3,015	6.80	5,180
2.20	1,250	3.30	2,000	4.80	3,185	7.00	5,400

OTE.—The above table is applicable only for open-channel conditions. It is based on 4 discharge asurements made during 1906 and on the general form of the earlier curves. It is well defined between ge heights 1.0 foot and 3.5 feet. Above gage height 6.5 feet the rating curve is a tangent, the difference ng 110 per tenth.

Monthly discharge of Okoee River at McCays, Tenn., for 1906.

[Drainage area, 374 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary	4,850	695	1,450	3.88	4.47
ruary	1,180	750	896	2.40	2.50
ch	3,180	810	1,280	3.42	3.94
il	1,720	900	1,160	3.10	3.46
	1,150	640	853	2.28	2.63
	2,530	722	1,050	2.81	3.14
	2,850	695	1,300	3.48	4.01
ust	2,220	900	1,170	3.13	3.61
ember	3,020	810	1,200	3.21	3.58
ber	2,340	870	1,330	3.56	4.10
ember	18,000	750	1,920	5.13	5.72
mber	2,850	930	1,180	3.16	3.64
The year	18,000	640	1,230	3.29	44.80

TE.—Values for 1906 are excellent.

ELK RIVER NEAR ELKMONT, ALA.

his station was established June 24, 1904. It is located at the on bridge near Wilson's store, about 5 miles east of Elkmont, Ala., 3 miles below the bridge of the Louisville and Nashville Railroad. conditions at this station and the bench marks are described in er-Supply Paper No. 169, page 141, where are given also refer- s to publications that contain data for previous years.

Discharge measurements of Elk River near Elkmont, Ala., in 1905 and 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 12	W. E. Hall	235	629	2.71	1,340
June 19	F. A. Murray	232	590	2.51	1,160
September 30	do	201	360	1.51	315
November 28	W. E. Hall	202	414	1.81	461
1906.					
March 22	W. E. Hall	233	847	3.58	2,800
May 10	F. A. Murray	230	508	2.41	1,050
June 23	O. P. Hall	221	400	1.75	463
October 26	F. A. Murray	231	606	2.53	1,190
October 26	do	231	605	2.54	1,210
December 11	W. E. Hall	230	583	2.50	1,200

Daily gage height, in feet, of Elk River near Elkmont, Ala., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.8	3.85	2.7	8.6	2.75	2.5	1.75	2.9	2.0	13.3	2.2	2.3
2	3.9	3.5	3.0	6.8	2.6	2.8	1.7	2.7	2.0	9.8	2.2	2.4
3	6.3	3.3	8.7	5.3	2.6	2.7	1.65	2.55	2.0	13.3	2.15	2.5
4	5.6	3.3	10.7	4.8	2.7	2.6	1.85	2.5	2.15	11.3	2.15	2.55
5	4.9	3.25	5.9	4.6	2.6	3.0	1.7	2.45	2.2	8.3	2.15	2.55
6	4.4	3.15	4.8	4.4	2.65	2.5	1.9	2.6	2.2	12.3	2.1	2.5
7	4.4	3.1	4.1	4.2	2.85	2.4	1.7	2.1	2.1	10.0	2.1	2.7
8	4.4	3.0	3.9	3.8	2.75	2.2	1.8	2.0	2.0	8.2	2.15	2.7
9	4.3	2.9	3.7	3.4	2.5	2.15	1.75	2.0	2.1	5.9	2.15	2.5
10	4.0	2.9	3.55	4.2	2.4	2.4	1.8	1.9	2.3	5.1	2.15	2.5
11	4.0	2.85	3.35	4.0	2.3	2.2	1.7	2.0	4.3	4.4	2.1	2.5
12	7.0	2.8	3.15	3.8	2.3	2.05	1.6	2.2	3.0	4.0	2.1	4.4
13	6.0	2.8	3.05	3.4	2.15	2.5	2.2	2.9	2.4	4.0	2.1	4.4
14	5.5	2.75	4.4	3.2	2.2	2.35	3.5	3.4	2.4	3.9	2.05	4.4
15	5.0	2.75	7.1	3.3	2.3	2.5	3.2	3.4	2.3	3.8	2.07	4.5
16	5.0	2.7	5.6	3.2	2.2	2.1	2.35	3.65	2.2	3.15	2.1	6.3
17	5.5	2.6	4.6	3.05	2.2	2.05	2.7	3.1	2.1	3.1	2.15	9.6
18	4.6	2.55	4.4	3.0	2.1	2.0	3.0	2.9	2.0	3.0	2.2	8.0
19	5.0	2.5	4.1	2.95	2.0	1.9	3.3	2.6	7.9	3.15	3.8	6.7
20	4.6	2.5	4.0	2.8	2.0	1.8	2.7	2.45	4.2	3.1	6.8	5.6
21	4.4	2.5	3.9	2.7	1.9	1.8	3.35	2.2	3.0	3.0	6.3	5.0
22	9.1	2.55	3.7	2.6	2.4	1.8	3.0	2.0	3.85	2.9	5.8	4.9
23	12.5	2.6	3.4	2.8	1.9	1.8	2.8	2.2	5.8	2.8	4.2	4.4
24	14.0	2.6	3.3	2.6	1.9	1.75	3.5	2.3	4.0	2.7	3.8	3.75
25	11.4	2.65	3.2	2.55	1.85	2.1	3.3	2.4	3.4	2.6	3.5	3.5
26	7.5	2.75	3.1	2.5	4.0	1.9	2.85	2.5	4.5	2.5	3.5	3.35
27	5.9	2.8	3.75	3.8	3.2	1.9	2.55	2.4	3.4	2.5	3.1	3.2
28	5.1	2.8	4.8	3.15	3.05	1.8	2.35	2.3	7.6	2.2	3.0	4.4
29	4.7	.....	5.3	3.25	3.15	1.8	4.0	2.2	16.4	2.2	2.8	5.7
30	4.6	.....	11.5	2.9	3.1	1.75	3.7	2.1	18.5	2.3	2.5	6.0
31	4.5	.....	5.6	.....	2.7	.....	3.25	2.0	.....	2.3	.....	11.2

Rating table for Elk River near Elkmont, Ala., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.50	315	2.60	1,270	3.70	3,030	5.60	7,520
1.60	375	2.70	1,400	3.80	3,220	5.80	8,080
1.70	440	2.80	1,530	3.90	3,420	6.00	8,640
1.80	510	2.90	1,670	4.00	3,620	6.20	9,210
1.90	585	3.00	1,820	4.20	4,040	6.40	9,790
2.00	660	3.10	1,970	4.40	4,490	6.60	10,380
2.10	740	3.20	2,130	4.60	4,950	6.80	10,980
2.20	830	3.30	2,300	4.80	5,430	7.00	11,600
2.30	930	3.40	2,480	5.00	5,930	8.00	14,800
2.40	1,040	3.50	2,660	5.20	6,450		
2.50	1,150	3.60	2,840	5.40	6,980		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904 to 1906. It is well defined between gage heights 1.2 feet and 4.0 feet. Above gage height 7.0 feet the rating curve is a tangent, the difference being 320 per tenth.

Monthly discharge of Elk River at Elkmont, Ala., for 1906.

[Drainage area, 1,700 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	34,000	3,220	8,740	5.14	5.93
February	3,320	1,150	1,660	.976	1.02
March	26,000	1,400	5,860	3.45	3.98
April	16,700	1,150	3,430	2.02	2.25
May	3,620	548	1,220	.718	.83
June	1,820	475	848	.499	.56
July	3,620	375	1,370	.806	.93
August	2,940	585	1,200	.706	.81
September	48,400	660	5,580	3.28	3.66
October	31,800	830	7,960	4.68	5.40
November	11,000	700	2,160	1.27	1.42
December	25,000	930	5,350	3.15	3.63
The year	48,400	375	3,782	2.22	30.42

NOTE.—Values are rated as follows: February and March, 1905, and January, September, and October, 1906, good; remainder of 1905 and 1906, excellent.

DUCK RIVER AT COLUMBIA, TENN.

This is an old Weather Bureau station that has not been maintained continously. Discharge measurements were made during 1904 and gage heights have been regularly recorded since October 31, 1904. The station is located at the highway bridge two blocks north of the public square at Columbia, Tenn. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 143, where are given also references to publications that contain data for previous years. A new gage, established June 27, 1905, is set at the same datum with the old gage of the United States Weather Bureau, which is a vertical timber 38 feet long bolted to the downstream side of the right-bank pier.

Discharge measurements of Duck River near Columbia, Tenn., 1901 to 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	D cha
		Feet.	*Sq. ft.*	*Feet.*	*Se*
1901.					
February 9	M. R. Hall	138	1,100	3.60	
April 19	do	175	2,380	11.90	
1904.					
May 21	J. M. Giles	85	610	.70	
August 18	do	115	755	.70	
August 18	do	115	725	.70	
October 21	do	79	139	.44	
October 21	do	79	144	.40	
1905.					
April 14	W. E. Hall	115	772	1.21	
June 16	F. A. Murray	134	823	1.63	
June 17	do	136	863	1.97	
June 20	do	121	772	1.34	
September 29	do	86	95	.60	
November 27	W. E. Hall	115	718	.77	
1906.					
March 23	W. E. Hall	120	847	1.90	
May 11	F. A. Murray	116	752	1.02	
May 11	do	116	752	1.00	
June 25	O. P. Hall	112	713	0.94	
October 27	F. A. Murray	119	761	1.12	
October 27	do	119	761	1.10	
December 12	W. E. Hall	115	749	1.15	

Daily gage height, in feet, of Duck River near Columbia, Tenn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.6	2.55	1.3	9.4	2.0	1.6	0.55	2.15	0.85	8.2	0.9
2	2.55	2.3	1.35	6.2	1.65	2.0	.6	1.6	.75	9.9	.95
3	3.3	2.15	8.2	4.7	1.45	1.5	.8	1.15	.65	13.9	.85
4	5.5	1.95	8.2	3.8	1.35	1.2	.8	1.15	.6	12.4	.85
5	4.6	1.7	4.4	3.0	1.3	1.15	.7	1.05	.75	9.8	.8
6	3.7	1.6	2.9	3.4	1.3	1.25	.65	1.15	1.6	15.2	.85
7	3.0	1.6	2.75	3.4	1.35	1.15	.7	0.95	1.05	13.0	.8
8	2.8	1.55	2.6	2.8	1.25	1.1	1.5	0.8	.85	8.3	.8
9	3.6	1.45	2.45	3.8	1.15	1.0	.95	0.8	.85	5.4	.8
10	3.2	1.35	2.3	3.4	1.15	.85	.75	1.3	1.95	3.9	.75
11	3.4	1.3	1.95	2.7	1.05	.9	.7	1.3	2.55	3.0	.8
12	7.6	1.25	1.85	2.35	.9	.85	.65	2.35	4.0	2.5	.8
13	7.4	1.2	1.75	2.25	.8	1.1	.6	2.3	2.45	2.25	.8
14	5.8	1.2	2.15	2.05	.8	1.1	1.7	2.3	1.65	1.85	.85
15	4.6	1.2	2.75	2.0	.9	1.0	1.2	1.6	1.25	1.6	.95
16	4.0	1.2	2.95	1.85	.75	.9	1.0	1.55	.95	1.35	.85
17	3.6	1.15	2.75	1.8	.8	.85	10.3	1.4	.85	1.4	1.15
18	3.0	1.05	2.55	1.6	.8	.8	10.4	1.25	.8	1.55	10.6
19	2.9	1.1	2.4	1.5	.75	.8	4.9	1.5	.95	1.6	13.3
20	2.65	1.1	2.4	1.45	.7	.8	3.6	1.25	1.2	1.8	9.8
21	2.5	1.1	2.25	1.4	.65	.75	4.0	1.2	2.4	1.7	7.2
22	13.8	1.2	2.05	1.4	.6	.65	3.4	1.2	3.1	1.55	5.2
23	26.4	1.25	1.9	1.3	.6	.7	2.5	2.85	7.5	1.4	3.7
24	24.2	1.3	1.75	1.3	.6	.95	2.5	2.35	4.2	1.25	3.0
25	9.6	1.3	1.7	1.2	.8	.75	2.3	1.75	2.65	1.15	2.75
26	5.8	1.3	1.6	1.15	2.5	.75	1.8	2.1	3.1	1.1	2.3
27	4.8	1.3	10.4	4.1	2.75	.65	1.4	1.7	2.7	1.1	2.05
28	3.9	1.3	11.0	3.1	2.25	.6	1.15	1.25	6.2	1.05	1.85
29	3.4	.....	17.2	3.2	2.05	.55	1.2	1.15	20.9	0.95	1.8
30	3.0	.....	22.6	2.05	1.6	.5	2.1	1.05	9.9	1.0	1.65
31	2.75	.....	17.1	.....	1.15	.....	3.6	0.95	.....	0.95	.....

Rating tables for Duck River near Columbia, Tenn.

OCTOBER 21, 1904, TO DECEMBER 24, 1904.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.30	80	0.60	222	0.90	408	2.00	1,200
0.40	122	0.70	280	1.00	475	2.50	1,600
0.50	170	0.80	342	1.50	825		

DECEMBER 25, 1904, TO DECEMBER 31, 1906.[b]

0.40	60	1.20	510	2.00	1,080	2.80	1,730
0.50	100	1.30	580	2.10	1,160	2.90	1,815
0.60	145	1.40	650	2.20	1,240	3.00	1,900
0.70	195	1.50	720	2.30	1,320	3.10	1,990
0.80	250	1.60	790	2.40	1,400	3.20	2,080
0.90	310	1.70	860	2.50	1,480		
1.00	375	1.80	930	2.60	1,560		
1.10	440	1.90	1,005	2.70	1,645		

[a] This table is applicable only for open-channel conditions. It is based on 5 discharge measurements made during 1904 and on the form of the 1905-6 curve.

[b] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1901, 1905, and 1906. It is well defined between gage heights 0.5 foot and 4.0 feet. Above gage height 4.0 feet it is based on a discharge measurement at gage height 11.90 made in 1901. Above gage height 3.00 feet the rating curve is a tangent, the difference being 90 per tenth.

Monthly discharge of Duck River near Columbia, Tenn., for 1904 to 1906.

[Drainage area, 1,260 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft per sq. mile.	Depth in inches.
1904.					
...ber 21-31	170	80	133	0.106	0.04
...ember	280	80	137	.109	.12
...mber	14,000	101	1,730	1.37	1.58
1905.					
...uary	11,800	310	1,990	1.58	1.82
...ruary	14,700	80	4,210	3.34	3.48
...ch	17,800	755	3,080	2.44	2.81
...il	1,360	250	621	.493	.55
...	25,600	440	3,500	2.78	3.20
...e	9,460	280	1,960	1.56	1.74
...	8,380	170	1,210	.960	1.11
...ust	2,980	100	654	.519	.60
...tember	3,340	100	388	.307	.34
...ober	3,340	80	1,050	.833	.96
...ember	685	145	307	.244	.27
...ember	9,460	510	3,050	2.42	2.79
The year	25,600	80	1,830	1.46	19.67
1906.					
...uary	23,000	1,480	4,430	3.51	4.05
...ruary	1,520	408	675	.536	.56
...ch	19,500	580	3,600	2.86	3.30
...il	7,660	475	1,800	1.43	1.60
...	1,690	145	543	.431	.50
...e	1,080	100	350	.286	.32
...	8,560	122	1,400	1.11	1.28
...ust	1,770	250	731	.580	.67
...tember	18,000	145	2,040	1.62	1.81
...ober	12,900	342	3,160	2.51	2.89
...ember	11,200	222	1,790	1.42	1.58
...ember	15,300	440	2,640	2.10	2.42
The year	23,000	100	1,930	1.53	20.98

NOTE.—Values are rated as follows: October, 1904, to March, 1905, May and December, 1905, and January, March September, October, and December, 1906, good; all remaining months, excellent.

MISCELLANEOUS MEASUREMENTS IN TENNESSEE RIVER DRAINAGE BASIN.

The following is a list of miscellaneous discharge measurements made in Tennessee River drainage basin during 1906:

French Broad River at Oldtown, Tenn.—This was originally one of the temporary stations established in connection with the general hydrographic study of the southern Appalachian region. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 93, where are given also references to publications that contain data for previous years.

The following discharge measurement was made May 25, 1906:

Width, 379 feet; area, 1,600 square feet; gage height, 1.67 feet; discharge, 2,010 second-feet.

Swannanoa River at Biltmore, N. C.—This station was established May 21, 1904, for the purpose of making miscellaneous measurements. It is located at the Biltmore, N. C., terminal of the Asheville-Biltmore electric railway line, about three-fourths mile above the mouth of Swannanoa River. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 95, where are given also references to publications that contain data for previous years.

The following discharge measurement was made April 16, 1906:

Width, 80 feet; area, 266 square feet; gage height, 2.35 feet; discharge, 617 second-feet.

Avery Creek at Davidsons River, N. C.—This station was established May 19, 1904, for the purpose of making miscellaneous measurements. It is located about one-fourth mile above the junction of Avery Creek with Davidsons River and a less distance from the regular gaging station on the latter stream. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 104, where are given also references to publications that contain data for previous years.

The following measurement was made June 15, 1906:

Width, 23 feet; area, 42 square feet; gage height, 2.80 feet; discharge, 169 second-feet.

Pigeon River at Newport, Tenn.—This station is located at the highway bridge in the eastern part of Newport, Tenn., 1 mile from the railroad station and 1 mile above the dam of the Newport Flouring Mill, out of reach of backwater. The conditions at this station and the bench marks are described in Water-Supply Paper No. 169, page 110, where are given also references to publications that contain data for previous years.

ıe following discharge measurement was made May 24, 1906:

lth, 186 feet; area, 608 square feet; gage height, 1.34 feet; discharge, 663 second-

e River at Elizabethton, Tenn.—This station was established May 904, for the purpose of making miscellaneous measurements. It ated at the covered wagon bridge in the town of Elizabethton, . The conditions at this station and the bench marks are ibed in Water-Supply Paper No. 169, page 121, where are given eferences to publications that contain data for previous years.

e following discharge measurement was made October 23, 1906:

th, 129 feet; area, 281 square feet; gage height, 1.63 feet; discharge, 318 second-

tle Tennessee River at Almond, N. C.—This station is located at ıpension footbridge across Little Tennessee River, about one-h mile above its junction with Nantahala River and about 300 from the station at the Southern Railway bridge on Nantahala r. The section is about 200 feet wide; the bed is very rough he current moderately swift. Gage heights for discharge meas-ents are determined by measuring down from a bench mark, h consists of 3 nails driven in the upstream side of an elm tree on ft bank of river, 20 feet upstream from the footbridge; elevation, feet above gage datum.

e following discharge measurement was made June 9, 1906:

th, 187 feet; area, 398 square feet; gage height, 2.27 feet; discharge, 938 second-

ntahala River at Almond, N. C.—This station is located at the hern Railway bridge crossing Nantahala River about one-fourth above its junction with Little Tennessee River. Discharge urements are made from the railroad bridge. The section is t 160 feet wide and is shallow and very swift, but fairly good neasurements. Only low-water measurements are made and age heights are determined from a bench mark, there being no The bench mark is the center of the bolt or pin connecting ntermediate post and the floor beam at the middle of the left on the upstream side of the bridge; elevation, 15.00 feet above datum.

e following discharge measurement was made June 8, 1906:

th, 121 feet; area, 166 square feet; gage height, 1.12 feet; discharge, 649 second-

ghtingtown Creek at McCays, Tenn.—This station was established ıst 27, 1904, for the purpose of making miscellaneous measure-s. It is located about one-half mile above the mouth of the , which flows into Okoee River about one-half mile below the ıg station on Okoee River at McCays, Tenn. The conditions at

this station and the bench marks are described in Water-Supply Paper No. 169, page 140, where are given also references to publications that contain data for previous years.

The following discharge measurements were made in 1906:

April 19: Width, 43 feet; area, 164 square feet; gage height, 2.85 feet; discharge, 241 second-feet. June 12: Width, 40 feet; area, 130 square feet; gage height, 2.25 feet; discharge, 129 second-feet.

Paint Rock River near Paintrock, Ala.—This station is located at the highway bridge 2¾ miles south of Paintrock, Ala., and about 400 feet above the Southern Railway bridge. The conditions at this station and the bench marks are described in Water-Supply Paper No. 128, page 149.

Discharge measurements of Paint Rock River near Paintrock, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 12	F. A. Murray	63	248	1.31	118
June 26	O. P. Hall	65	222	1.13	87
October 29	F. A. Murray	64	266	1.51	155

Flint River at Brownsboro, Ala.—This station is located at the highway bridge about one-fourth mile west of Brownsboro, Ala., and 100 feet below a 6-foot milldam. The conditions at this station and the bench marks are described in Water-Supply Paper No. 128, page 150.

Discharge measurements of Flint River at Brownsboro, Ala., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
May 12	F. A. Murray	140	450	1.89	224
June 22	O. P. Hall	140	398	1.65	158
October 29	F. A. Murray	144	454	2.01	237

LOWER EASTERN MISSISSIPPI RIVER DRAINAGES.

The streams flowing into Mississippi River from the east below the mouth of the Ohio are in the main comparatively small. In the lower portion they are practically a network of bayous. The following pages contain the results of data collected in the lower eastern Mississippi River drainage by the United States Geological Survey during 1906:

YAZOO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Yazoo River rises in the northwestern part of Mississippi. It flows southward just west of the central portion of the State and enters Mississippi River just above Vicksburg.

TALLAHATCHIE RIVER AT BATESVILLE, MISS.

This station was established on June 15, 1906. It is located at the nty highway bridge 1 mile west of Batesville and about 2 miles ow the crossing of the Illinois Central Railroad. The bridge from ich discharge measurements are made is a single steel span 220 feet g, with wooden approaches at both ends.

Both banks will overflow at high floods, sometimes beyond the ends the bridge approaches. The bed is mostly firm sand, and the cur- it is fairly good. An island about 300 feet below the station ides the river into two channels, the combined width of which pears to be less than that of the river above, making the water ifter.

The boxed-chain gage is bolted to the upstream lower chord in the ird panel from the left bank; length of chain, 29.96 feet. The gage read once a day by J. S. Goff.

The reference point is the top of the downstream end of the third or beam from the left-bank end of the bridge; elevation, 27 feet ove gage datum.

Discharge measurements of Tallahatchie River at Batesville, Miss., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
rch 17	W. E. Hall	146	679	4.13	1,020
ne 15	M. R. Hall	135	507	2.92	584
ptember 20	do	128	393	2.33	468

Daily gage height, in feet, of Tallahatchie River at Batesville, Miss., for 1906.

Day.	June.	July.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Sept.	Oct.	Nov.	Dec.
		2.8		9.0	3.1	14.2	17	2.85	5.2		11.0	3.0	13.7
		3.8		10.6	3.1	13.0	18	2.8	5.1		7.8	2.95	13.3
		2.75		12.2	3.1	11.1	19	2.8	4.6		5.2	2.95	13.1
		2.75		13.0	3.1	8.3	20	2.8	4.8	2.3	4.0	9.0	13.1
		2.7		13.6	3.0	6.5	21	2.8	5.1	2.45	4.0	18.0	13.1
		2.7		14.1	3.0	6.8	22	2.85	4.7	4.0	4.0	18.6	13.0
		2.7		14.0	3.0	7.0	23	2.8	4.3	3.9	3.6	18.2	13.2
		2.8		14.0	3.0	6.9	24	2.8	3.5	3.8	3.8	18.1	13.1
		2.9		13.9	3.0	7.0	25	2.9	3.2	3.3	3.6	17.9	13.0
		2.85		13.4	3.0	8.0	26	3.5	2.8	3.2	3.6	17.4	12.7
		2.9		13.3	3.0	8.0	27	2.9	2.75	3.1	3.6	16.9	12.6
		3.0		13.3	3.0	7.8	28	2.85	2.6	10.0	3.2	16.5	12.1
		3.4		13.6	3.0	7.6	29	2.8	2.5	9.6	3.2	16.0	9.6
		3.0		13.3	3.0	7.7	30	2.8	2.6	8.6	3.2	15.0	8.3
	2.9	2.8		13.0	3.0	8.0	31		2.55		3.2		8.6
	2.85	3.5		12.0	3.0	11.0							

YALOBUSHA RIVER AT GRENADA, MISS.

This station was established on June 14, 1906. It is located in e western part of Grenada at the county highway bridge, about e-half mile from the depot and the same distance below the cross-

ing of the Illinois Central Railroad. The bridge from which measurements are made is 260 feet long, there being a main span of 160 feet across the river and two short spans of 50 feet each on the right bank.

Both banks of the river are high and not liable to overflow. The current is fairly swift and regular. The bed is sandy and is liable to shift, but conditions below the station will probably cause the rating to remain constant.

The boxed chain gage is bolted to a special timber, which is itself bolted to the intermediate post and diagonal brace on the downstream side of the bridge in the fourth panel from the left bank; length of chain, 40.71 feet.

The reference point is the top of the downstream corner of a plate near bridge floor on the right side of the intermediate post at downstream end of the third floor beam from the left bank: elevation 37.94 feet above gage datum.

Discharge measurements of Yalobusha River at Grenada, Miss., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 19	W. E. Hall	118	1,190	11.20	[illegible]
May 2	do	80	136	1.85	[illegible]
June 14	M. R. Hall	79	132	1.52	[illegible]
September 19	do	78	121	1.22	[illegible]
September 19	do	78	120	1.22	[illegible]

Daily gage height, in feet, of Yalobusha River at Grenada, Miss., for 1906.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug	Sept.	Oct.	Nov.
1		2.3	1.2	1.0	13.3	1.4	17	3.3	4.3		1.2	2.7	[illegible]
2		2.2		.9	13.8	1.4	18	2.5	4.1		1.0	2.35	[illegible]
3		1.5		.9	13.4	1.4	19	2.3	4.2		1.2	2.1	[illegible]
4		1.4		.9	12.8	1.45	20	1.9	4.3		1.2	2.0	[illegible]
5		1.1		2.8	18.3	1.4	21	1.7	4.1		1.5	1.9	[illegible]
6		1.1		3.3	18.8	1.35	22	1.5	3.7		1.9	1.8	[illegible]
7		1.3		2.8	17.9	1.35	23	1.4	3.2		1.35	1.7	[illegible]
8		1.3		2.8	17.6	1.35	24	1.3	3.9		1.8	1.65	[illegible]
9		1.3		2.3	16.6	1.35	25	1.4	3.2		1.55	1.6	[illegible]
10		1.2		1.9	15.3	1.35	26	2.1	2.3	1.5	2.45	1.55	[illegible]
11		2.0		1.7	13.4	1.35	27	1.3	1.8	1.9	11.0	1.5	[illegible]
12		2.7		1.4	8.6	1.35	28	1.2	1.6	1.5	14.4	1.45	[illegible]
13		2.8		1.3	7.0	1.35	29	1.1	1.4	1.2	13.7	1.45	[illegible]
14	1.5	2.7		1.3	6.5	1.35	30	1.1	1.3	1.1	12.5	1.4	[illegible]
15	2.2	2.7		1.2	4.4	1.35	31		1.3	1.0		1.4	[illegible]
16	4.0	2.4		1.1	3.2	1.35							

HOMOCHITTO RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Homochitto River drains a small area in the southwestern part of the State of Mississippi. It rises in the southwestern part of Copiah County and flows in a southwesterly direction into Mississippi River. The United States Geological Survey maintains one station on this river at Rosetta, Miss.

HOMOCHITTO RIVER AT ROSETTA, MISS.

This station was established June 16, 1906. It is located at the Yazoo and Mississippi Valley Railroad bridge in the town of Rosetta.

The river at high stages will overflow the right bank under the bridge trestle and will overflow left bank under the trestle and through short opening in the embankment. The bed of the river is sand and may shift considerably.

The chain gage is attached to the downstream guard rail at the first floor beam from the right end of the bridge; length of chain from end of weight to marker, 34.79 feet. The gage is read once a day by William Z. Taylor.

The reference point is the top of the extreme downstream end of the first floor beam from the right-bank pier; elevation, 30 feet above gage datum.

Discharge measurements of Homochitto River at Rosetta, Miss., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 30	W. E. Hall	125	846	5.75	704
June 15	M. R. Hall	96	451	3.51	308
September 22	do	92	476	3.78	391

Daily gage height, in feet, of Homochitto River at Rosetta, Miss., for 1906.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		3.75	3.5	3.0	4.8	3.7	17	3.5	5.5	3.9	3.2	3.9	
2		3.5	3.4	3.15	4.3	3.6	18	3.4	7.0	3.7	3.1	4.7	
3		5.4	3.3	3.1	6.0	3.6	19	3.5	7.8	3.6	3.0	4.65	
4		4.35	4.2	3.6	5.9	3.7	20	3.6	6.1	3.6	2.95	4.4	
5		3.9	5.5	4.5	6.8	3.6	21	3.1	4.5	3.5	4.35	4.2	
6		3.5	4.7	5.0	9.9	3.6	22	3.2	6.8	3.9	3.5	4.6	
7		3.0	3.7	4.4	8.9	3.5	23	3.3	6.8	3.6	3.0	4.1	
8		3.25	3.6	4.0	8.3	3.5	24	3.35	4.8	4.0	3.8	4.0	
9		3.4	3.7	3.7	8.8	3.5	25	3.15	4.1	3.1	3.3	3.9	
10		5.5	3.	3.	7.0	3.6	26	3.7	3.8	4.5	3.6	3.9	
11		5.6	3.	3.	6.1	3.6	27	3.6	3.7	4.7	3.9	3.7	
12		5.9	3.0	6.2	5.5	3.5	28	3.6	3.7	4.55	6.4	3.7	
13		7.8	3.3	3.95	5.3		29	3.95	4.9	3.7	8.8	3.8	
14		6.6	3.5	3.4	5.0		30	3.6	4.1	3.2	4.9	3.8	
15		5.6	3.4	3.4	4.9		31		3.9	3.1		3.7	
16	3.5	6.0	3.1	3.3	4.7								

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CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 205.]

The publications of the United States Geological Survey consist of (1) Annual Reports; (2) Monographs; (3) Professional Papers; (4) Bulletins; (5) Mineral Resources; (6) Water-Supply and Irrigation Papers; (7) Topographic Atlas of United States, folios and separate sheets thereof; (8) Geologic Atlas of United States, folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists can be had on application.

Most of the above publications can be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they can be obtained, free of charge (except classes 2, 7, and 8), on application.

2. A certain number are delivered to Senators and Representatives in Congress, for distribution.

3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they can be had at practically cost.

4. Copies of all Government publications are furnished to the principal public libraries in the large cities throughout the United States, where they can be consulted by those interested.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports.

Series P.—The hydrographic progress reports contain the results of stream measurements. A report is issued for every calendar year, containing the results of data collected during that year. These reports were first published as a part of the Director's annual report or as a bulletin; they are now published as water-supply and irrigation papers. The following is a list, by years, of the publications containing the progress reports of stream measurements (* means out of stock). A detailed index of these reports (1888–1903) is published as Water-Supply Paper No. 119.

1888. Tenth Annual Report, Part II*.
1889. Eleventh Annual Report, Part II*.
1890. Twelfth Annual Report, Part II*.
1891. Thirteenth Annual Report, Part III*.
1892. Fourteenth Annual Report, Part II*.
1893. Bulletin No. 131*.
1894. Bulletin No. 131*; Sixteenth Annual Report, Part II*.
1895. Bulletin No. 140*.
1896. Water-Supply Paper No. 11*; Eighteenth Annual Report, Part IV*.
1897. Water-Supply Papers Nos. 15* and 16*; Nineteenth Annual Report, Part IV*.
1898. Water-Supply Papers Nos. 27* and 28*; Twentieth Annual Report, Part IV*.
1899. Water-Supply Papers Nos. 35*, 36*, 37*, 38*, and 39*; Twenty-first Annual Report, Part IV*.
1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.
1901. East of Mississippi River, Water-Supply Papers Nos. 65* and 75*.
West of Mississippi River, Water-Supply Papers Nos. 66 and 75*.

1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.
1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.
1905. East of Mississippi River, Nos. 165*, 166*, 167, 168*, 169, 170, and 171.
West of Mississippi River, Nos. 171, 172*, 173*, 174, 175*, 176, 177, and 178.
1906. East of Mississippi River, Nos. 201, 202, 203, 204, 205, 206, and 207.
West of Mississippi River, Nos. 207, 208, 209, 210, 211, 212, 213, and 214.

Correspondence should be addressed to

THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

JULY, 1907.

O

Water-Supply and Irrigation Paper No. 206 Series P, Hydrographic Progress Reports, 60

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY

OF

GREAT LAKES AND ST. LAWRENCE RIVER DRAINAGES, 1906

H. K. BARROWS
A. H. HORTON
DISTRICT HYDROGRAPHERS

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.
1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.
1905. East of Mississippi River, Nos. 165*, 166*, 167, 168*, 169, 170, and 171.
West of Mississippi River, Nos. 171, 172*, 173*, 174, 175*, 176, 177, and 178.
1906. East of Mississippi River, Nos. 201, 202, 203, 204, 205, 206, and 207.
West of Mississippi River, Nos. 207, 208, 209, 210, 211, 212, 213, and 214.

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URFACE WATER SUPPLY OF THE GREAT LAKES AND ST. LAWRENCE RIVER DRAINAGES, 1906.[a]

H. K. BARROWS and A. H. HORTON,
District Hydrographers.[b]

INTRODUCTION.

SCOPE OF WORK.

The water supply of the United States is of more importance to the e and pursuits of the people than is any other natural resource. In ie arid States the limit of agricultural development is determined y the amount of water available for irrigation; while in all parts of ne country the increase in the population of cities and towns makes ecessary additional water supplies for domestic and industrial uses, n procuring which both the quantity and the quality of the water hat may be obtained must be considered. The location of manufacturing plants may depend largely on the water-power facilities and on the character of the water. The notable advances made in the electric transmission of power have led to the utilization of water powers for the operation of manufacturing establishments, railroads, and municipal lighting plants, many of which are at some distance from the places at which the power is developed.

The intelligent establishment and maintenance of enterprises or industries that depend on the use of water demands a thorough knowledge of the flow of the streams and an understanding of the conditions affecting that flow. This knowledge should be based on data showing both the total flow and the distribution of the flow throughout the year, in order that normal fluctuations may be provided for. As the flow of a stream is variable from year to year, estimates of future flow can be made only from a study of observations

[a] This report contains information similar to that published in previous years under the title "Report on Progress of Stream Measurements."

[b] The data presented in this report were collected as follows:

New York and New England under the direction of H. K. Barrows, assisted by Robert E. Horton and C. C. Covert.

Michigan and Wisconsin, A. H. Horton, district hydrographer, assisted by M. S. Brennan, L. S. Smith, V. H. Reineking, and D. H. Dugan.

The preparation of the data for publication has been under the direction of John C. Hoyt, assisted by R. H. Bolster, Robert Follansbee, F. F. Henshaw, J. E. Stewart, and H. D. Padgett.

covering several years. The rapid increase in the devel water resources of the United States has caused a gre engineers for information in regard to the flow of strear generally realized that the failure of many large power, other projects has been due to the fact that the pla without sufficient trustworthy information in respect supply.

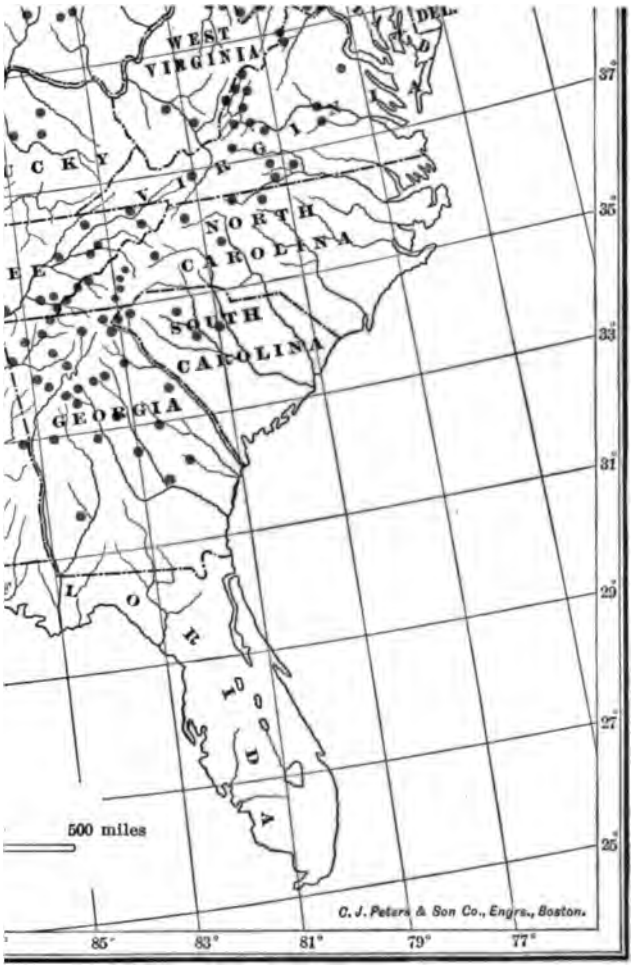
Owing to the broad scope of these hydrographic inve the length of time they should cover in order that the r of greatest value, it is in general impossible for private collect the necessary data, and as many of the streams than one State this work does not properly fall withi of the State authorities. The United States Geologic therefore, by means of specific appropriations by Congr years systematically made records of stream flow, wi ultimately determining all the important features gove of the principal streams of the country. In carrying stations are established on the streams and maintaine long enough to show their regimen or general beha record that is sufficient for this purpose has been ob stream the work on that stream is discontinued. The the streams are measured is determined by the degree tance.

During 1906 the regimen of flow was studied at abo distributed along the various rivers throughout the Un shown on Pl. I. In addition to these records data in cipitation, evaporation, water power, and river profiles in many sections of the country.

These data have been assembled by drainage areas, lished in a series of fourteen Water-Supply and Irri Nos. 201 to 214, inclusive, each of which pertains to th resources of a group of adjacent areas. In these papers not only the data collected in the field, but also the res tations based on these data, and other information th bearing on the subject, such as descriptions of basins a draining them, utility of the water resources, etc. Tl

Water-Supply and Irrigation Papers on Surface Water Supp

201. Surface water supply of New England, 1906 (Atlantic Coast drainage).
202. Surface water supply of the Hudson, Passaic, Raritan, and Del ages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (S powder, Patapsco, Potomac, James, Roanoke, and Yadkin ri
204. Surface water supply of the Southern Atlantic and Eastern (Santee, Savannah, Ogeechee, and Altamaha rivers and east drainages.)


WEST VIRGINIA
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
500 miles
37°
35°
33°
31°
29°
27°
25°
85°
83°
81°
79°
77°
C. J. Peters & Son Co., Engrs., Boston.

1906.

covering several years. The rapid increase in the development of the water resources of the United States has caused a great demand by engineers for information in regard to the flow of streams, as it is now generally realized that the failure of many large power, irrigation, and other projects has been due to the fact that the plans were made without sufficient trustworthy information in respect to the water supply.

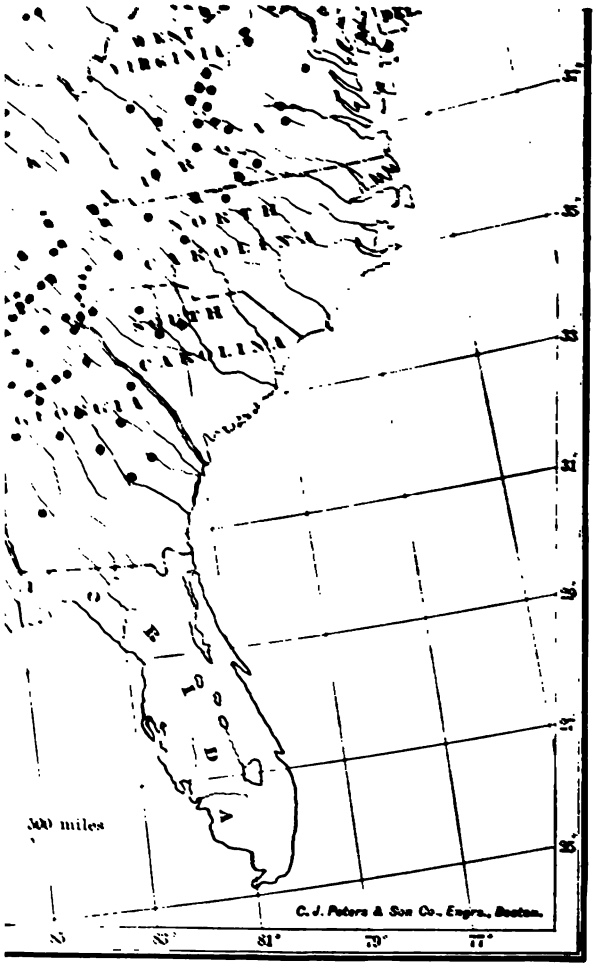
Owing to the broad scope of these hydrographic investigations and the length of time they should cover in order that the records may be of greatest value, it is in general impossible for private individuals to collect the necessary data, and as many of the streams traverse more than one State this work does not properly fall within the province of the State authorities. The United States Geological Survey has therefore, by means of specific appropriations by Congress, for several years systematically made records of stream flow, with the view of ultimately determining all the important features governing the flow of the principal streams of the country. In carrying out this plan stations are established on the streams and maintained for a period long enough to show their regimen or general behavior. When a record that is sufficient for this purpose has been obtained for any stream the work on that stream is discontinued. The order in which the streams are measured is determined by the degree of their importance.

During 1906 the regimen of flow was studied at about 700 stations distributed along the various rivers throughout the United States, as shown on Pl. I. In addition to these records data in regard to precipitation, evaporation, water power, and river profiles were obtained in many sections of the country.

These data have been assembled by drainage areas, and are published in a series of fourteen Water-Supply and Irrigation Papers Nos. 201 to 214, inclusive, each of which pertains to the surface water resources of a group of adjacent areas. In these papers are embodied not only the data collected in the field, but also the results of computations based on these data, and other information that has a direct bearing on the subject, such as descriptions of basins and the streams draining them, utility of the water resources, etc. The list follows:

Water-Supply and Irrigation Papers on Surface Water Supply, 1906.

201. Surface water supply of New England, 1906 (Atlantic Coast of New England drainage).
202. Surface water supply of the Hudson, Passaic, Raritan, and Delaware river drainages, 1906.
203. Surface water supply of the Middle Atlantic States, 1906. (Susquehanna, Gunpowder, Patapsco, Potomac, James, Roanoke, and Yadkin river drainages.)
204. Surface water supply of the Southern Atlantic and Eastern Gulf States, 1906. (Santee, Savannah, Ogeechee, and Altamaha rivers and eastern Gulf of Mexico drainages.)


NORTH CAROLINA
SOUTH CAROLINA
FLORIDA
300 miles
C. J. Peters & Son Co., Engrs., Boston.
85°
83°
81°
79°
77°

96.

e water supply of the Ohio and lower eastern Mississippi river drainages,

e water supply of the Great Lakes and St. Lawrence River drainages, 1906.
e water supply of the upper Mississippi River and Hudson Bay drainage,

e water supply of the Missouri River drainage, 1906.
e water supply of the lower western Mississippi River drainage, 1906.
e water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
e water supply of the Colorado River drainage above Yuma, 1906.
e water supply of the Great Basin drainage, 1906.
e water supply of California, 1906. (The Great Basin and Pacific Ocean
nage in California, and Colorado River drainage below Yuma.)
e water supply of the North Pacific Coast drainages, 1906.

cords at most of the stations discussed in these reports
er a series of years. An index of the reports containing such
to and including 1903 has been published in Water-Supply
. 119. The following table gives, by years and primary
basins, the numbers of the papers on the surface water sup-
shed from 1901 to 1906.

water-supply papers containing results of stream measurements, 1901–1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
of New England drainage	65 75	82	97	124	165	201
aic, Raritan, and Delaware river	65 75	82	97	125	166	202
Gunpowder, Patapsco, Potomac, oke, and Yadkin river drainages	65 75	82 83	97 98	126	167	203
nah, Ogeechee, and Altamaha river Gulf of Mexico drainages	65 75	83	98	126	168	204
r eastern Mississippi river drainages	65 75	83	98	128	169	205
nd St. Lawrence River drainages	65	83	97	129	170	206
nd upper eastern and western Missis- drainages	65 66 75	83 84 85	98 99 100	128 130	171	207
r drainage	66 75	84	99	130 131	172	208
ansas, Red, and lower western Missis- rainages	66 75	84	99	131	173	209
f Mexico and Rio Grande drainages	66 75	84	99	132	174	210
r drainage above Yuma	66 75	85	100	133	175	211
in drainage	66 75	85	100	133	175	211
in and Pacific Ocean drainages in Cali- olorado River drainage below Yuma	66 75	85	100	134	177	213
Coast drainages	66 75	85	100	135	178	214

DEFINITIONS.

lume of water flowing in a stream—the "run-off" or "dis-
-is expressed in various terms, each of which has become
l with a certain class of work. These terms may be divided
groups—(1) those which represent a rate of flow, as second-
ons per minute, miner's inches, and run-off in second-feet

[a] ntaining data for years prior to 1901 are noted in the series list at the end of this paper.

per square mile, and (2) those which represent the actual qua of water, as run-off in depth in inches and acre-feet. They ms defined as follows:

"Second-foot" is an abbreviation for cubic foot per second a the quantity of water flowing in a stream 1 foot wide, 1 foot deep, rate of 1 foot per second. It is generally used as a fundamental from which others are computed.

"Gallons per minute" is generally used in connection with pum and city water supply.

The "miner's inch" is the quantity of water that passes throug orifice 1 inch square under a head which varies locally. It has commonly used by miners and irrigators throughout the West a defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic fe water flowing per second from each square mile of area drainec the assumption that the run-off is distributed uniformly bo regards time and area.

"Run-off in inches" is the depth to which the drainage area w be covered if all the water flowing from it in a given period were served and uniformly distributed on the surface. It is used for paring run-off with rainfall, which is usually expressed in dep inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the qua required to cover an acre to the depth of 1 foot. It is commonly in connection with storage for irrigation work. There is a conve relation between the second-foot and the acre-foot: One sec foot flowing for twenty-four hours will deliver 86,400 cubic fee approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.
6. Tables showing discharge and horsepower and the numb days during the year when the same are available.

The descriptions of stations give such general information abou locality and equipment as would enable the reader to find and us station, and they also give, as far as possible, a complete histo all the changes that have occurred since the establishment of the tion that would be factors in using the data collected.

The discharge-measurement table gives the results of the disch

easurements made during the year, including the date, the name of e hydrographer, the width and area of cross section, the gage eight, and the discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the rface of the river as found from the mean of the gage heights taken ach day. The gage height given in the table represents the elevation f the surface of the water above the zero of the gage. At most stations he gage is read in the morning and in the evening.

The discharge measurements and gage heights are the base data rom which the other tables are computed. In cases of extensive levelopment, it is expected that engineers will use these original data n making their calculations, as the computations made by the Survey are based on the data available at the time they are made and hould be reviewed and, if necessary, revised when additional data are vailable.

The rating table gives the discharge in second-feet, corresponding to various stages of the river, as given by the gage heights. It is published to enable engineers to determine the daily discharge in case this information is desired.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest, and it is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise, in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. Upon this the computations for the remaining columns, which are defined on page 4, are based.

The values in the table of monthly discharge are intended to give only a general idea of the conditions of flow at the station, and it is not expected that they will be used for other than preliminary estimates.

In most work where data in regard to flow are used the regimen of flow is of primary importance. Therefore for the principal stations tables have been prepared showing the horsepower that can be leveloped at various rates of flow and the length of time that these ates of flow and the corresponding horsepower are available. These ables have been prepared on a basis of 80 per cent efficiency on the urbines, and the horsepower per foot of fall is given in order that the eader can determine the horsepower for any fall.

In the computations sufficient significant figures have been used o that the percentage of error in the tables will not in general exceed per cent. Therefore most of the values in the tables are given to

only three significant figures. In making the various computation Thatcher's slide rule, Crelle's tables, and computation machines have been generally used.

In order to give engineers an idea of the relative value of the various data, notes in regard to accuracy are given as far as possible. This accuracy depends on the general local conditions at the gaging stations and the amount of data collected. Every effort possible is made to so locate the stations that the data collected will give a high degree of accuracy. This is not always possible, but it is considered better to publish rough values with explanatory notes rather than no data.

In the accuracy notes the following terms have been used, indicating the probable accuracy in per cent of the mean monthly flow. As these values are mean values, the error in the value for the flow of any individual day may be much larger.

Excellent indicates that the mean monthly flow is probably accurate to within 5 per cent; good, to within 10 per cent; fair, to within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydraulic computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equal 15.7 United States gallons per second.
100 California miner's inches equal 96.0 Colorado miner's inches.
100 California miner's inches for one day equal 4.96 acre-feet.
100 Colorado miner's inches equal 2.60 second-feet.
100 Colorado miner's inches equal 19.5 United States gallons per second.
100 Colorado miner's inches equal 104 California miner's inches.
100 Colorado miner's inches for one day equal 5.17 acre-feet.
100 United States gallons per minute equal 0.223 second-foot.

United States gallons per minute for one day equal 0.442 acre-foot.
00,000 United States gallons per day equal 1.55 second-feet.
00,000 United States gallons equal 3.07 acre-feet.
00,000 cubic feet equal 22.95 acre-feet.
cre-foot equals 325,850 gallons.
nch deep on 1 square mile equals 2,323,200 cubic feet.
nch deep on 1 square mile equals 0.0737 second-foot per year.
oot equals 0.3048 meter.
mile equals 1.60935 kilometers.
mile equals 5,280 feet.
acre equals 0.4047 hectare.
acre equals 43,560 square feet.
acre equals 209 feet square, nearly.
square mile equals 2.59 square kilometers.
cubic foot equals 0.0283 cubic meter.
cubic foot equals 7.48 gallons.
cubic foot of water weighs 62.5 pounds.
cubic meter per minute equals 0.5886 second-foot.
horsepower equals 550 foot-pounds per second.
horsepower equals 76.0 kilogram-meters per second.
horsepower equals 746 watts.
horsepower equals 1 second-foot falling 8.80 feet.
horsepower equal about 1 kilowatt.

calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water el, realizing 80 per cent of theoretical power.

FIELD METHODS OF MEASURING STREAM FLOW.

he methods used in collecting these data and in preparing them publication are given in detail in Water-Supply Papers No. 94 drographic Manual, U. S. Geological Survey) and No. 95 (Accu- of Stream Measurements). In order that those who use this rt may readily become acquainted with the general methods loyed, the following brief descriptions are given:

treams may be divided, with respect to their physical conditions, three classes—(1) those with permanent beds; (2) those with beds ch change only during extreme low or high water; (3) those with stantly shifting beds. In determining the daily flow special hods are necessary for each class. The data upon which these erminations are based and the methods of collecting them are, vever, in general the same.

here are three distinct methods of determining the flow of open- nnel streams—(1) by measurements of slope and cross section the use of Chezy's and Kutter's formulas; (2) by means of a weir; by measurements of the velocity of the current and the area of cross section. The method chosen for any case depends upon local physical conditions, the degree of accuracy desired, the funds ilable, and the length of time that the record is to be continued.

lope method.—Much information has been collected relative to

the coefficients to be used in the Chezy formula, $v = c\sqrt{Rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The results obtained by the slope method are, in general, only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in determining the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir methods.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining the flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable measurements of flow. The conditions necessary to insure good results may be divided into two classes—(1) those relating to the physical characteristics of the dam itself and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests, which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q = c\,b\,h^{\frac{3}{2}}$, or some similar standard weir formula are known (see Water-Supply Papers Nos. 180 and 200[a]); (*f*) either no flash boards or exceptional care in reducing leakage through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, the dam is built for purposes of power or navigation and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such determinations of flow the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured, either by a weir, a current meter, or a simple system of water wheels which are of standard make, or which have been rated as meters under working conditions, and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the determinations of flow will not involve, for a critical stage of considerable duration, the use of a head, on a broad

[a] Water-Supply Paper No. 200 replaces No. 150, the edition of which has been exhausted.

rested dam, of less than 6 inches. Moreover, when all other conditions are good, the cooperation of the owners or operators of the plant s still essential if reliable results are to be obtained.

A gaging station at a weir or dam has the general advantage of continuity of record through the period of ice and floods and the disadvantages of uncertainty of coefficient to be used in the weir formula and of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water flowing past a certain section of a stream at a given time is termed a discharge measurement. This quantity is the product of two factors—the mean velocity and the area of the cross section. The mean velocity is a function of surface slope, wetted perimeter, roughness of bed, and the channel conditions at, above, and below the gaging section. The area depends upon the contour of the bed and the fluctuations of the water surface. The two principal ways of measuring the velocity of a stream are by floats and current meters.

Great care is taken in the selection and equipment of gaging stations for determining discharge by velocity measurements in order that the data may have the required degree of accuracy. Their essential requirements are practically the same whether the velocity is determined by meters or floats. They are located as far as possible where the channel is straight both above and below the gaging section; where there are no cross currents, backwater, or boils; where the bed of the stream is reasonably free from large projections of a permanent character; and where the banks are high and subject to overflow only at flood stages. The station must be so far removed from the effects of tributary streams and of dams or other artificial obstructions that the gage height shall be an index of the discharge.

Certain permanent or semipermanent structures usually referred to as equipment are generally pertinent to a gaging station. These are a gage for determining the fluctuations of the water surface, bench marks to which the datum of the gage is referred, permanent marks on a bridge or a tagged line indicating the points of measurement, and, where the current is swift, some appliance (generally a secondary cable) to hold the meter in position in the water. As a rule, the stations are located at bridges if the channel conditions are satisfactory, as from them the observations can more readily be made and the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or rod floats. A corked bottle with a flag in the top and weighted at the bottom makes one of the most satisfactory surface floats, as it is affected but little by wind. In case of flood measurements, good results can be obtained by observing the velocity of floating cakes of ice or débris. In case of all surface-float measurements, coefficients must be used to reduce the observed velocity to the mean velocity.

The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

In measuring velocity by a float, observation is made of the time taken by the float to pass over the "run," a selected stretch of river from 50 to 200 feet long. In each discharge measurement a large number of velocity determinations are made at different points across the stream, and from these observations the mean velocity for the whole section is determined. This may be done by plotting the mean positions of the floats as indicated by the distances from the bank as ordinates and the corresponding times as abscissas. A curve through these points shows the mean time of run at any point across the stream, and the mean time for the whole stream is obtained by dividing the area bounded by this curve and its axis by the width. The length of the run divided by the mean time gives the mean velocity.

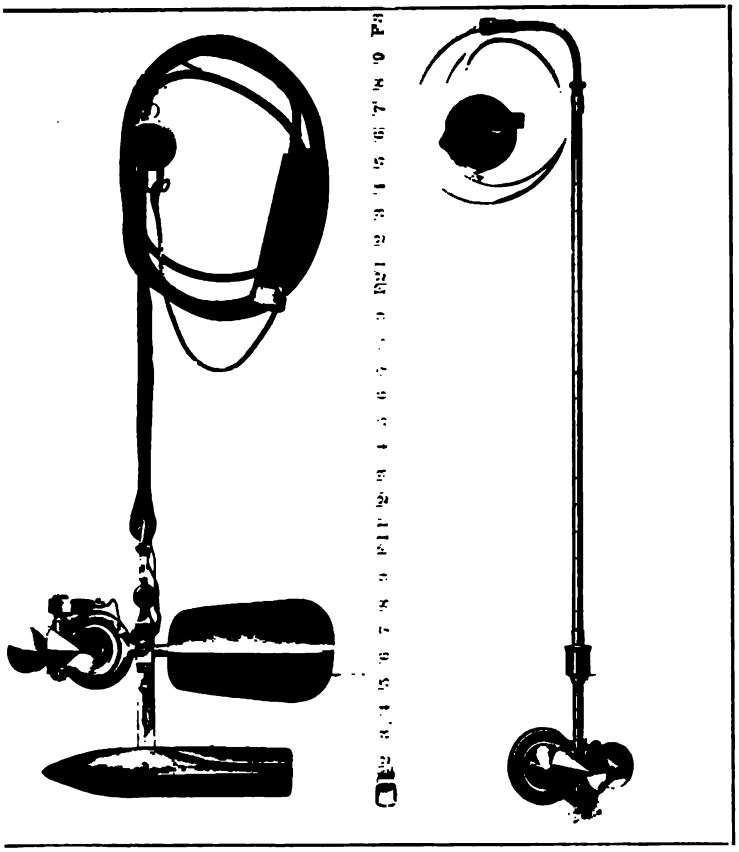
The area used in float measurements is the mean of the areas at the two ends of the run and at several intermediate sections.

The essential parts of the current meters in use are a wheel of some type, so constructed that the impact of flowing water causes it to revolve, and a device for recording or indicating the number of revolutions. The relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter. This rating is done by drawing the meter through still water for a given distance at different speeds and noting the number of revolutions for each run. From these data a rating table is prepared which gives the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They may, however, be classed in two general types: Those in which the wheel is made up of a series of cups, as the Price, and those having a screw propeller wheel, as the Haskell. Each meter has been developed for use under some special condition. In the case of the small Price meter, shown in Pl. II, *A*, which has been largely developed and has been extensively used by the United States Geological Survey, an attempt has been made to get an instrument which could be used under practically all conditions.

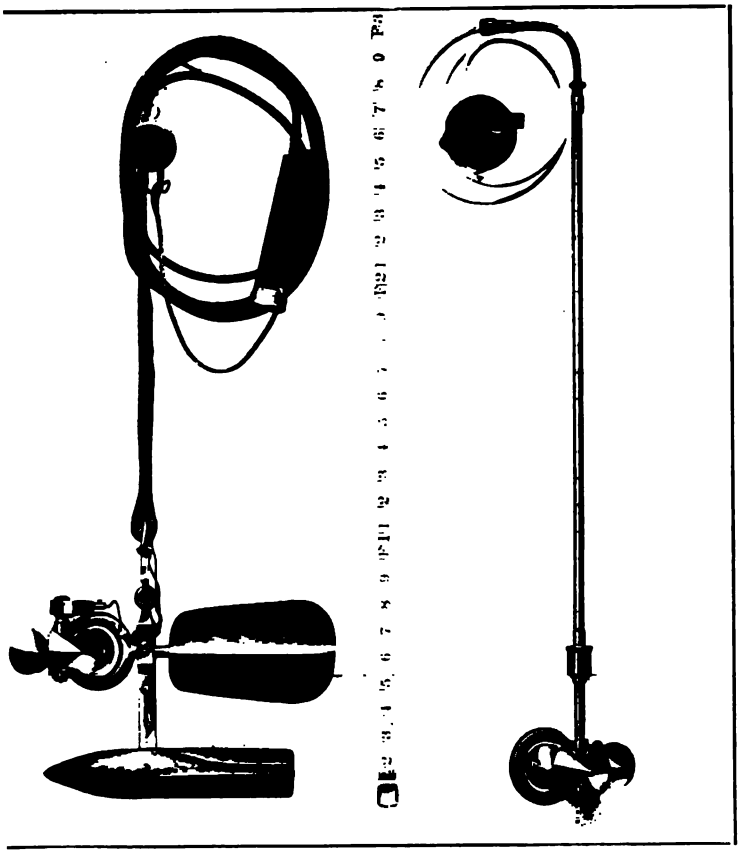
Current-meter measurements may be made from a bridge, a cable, a boat, or by wading, and gaging stations may be classified in accordance with such use. Fig. 1 shows a typical cable station.

In making the measurement an arbitrary number of points are laid off on a line perpendicular to the thread of the stream. The points at which the velocity and depth are observed are known as measuring points, and are usually fixed at regular intervals, varying from 2 to 20 feet, depending upon the size and condition of the stream. Perpendiculars dropped from the measuring points divide the gaging section into strips. For each strip or pair of strips the mean velocity,



.1. PRICE CURRENT METERS.

B. CURRENT-METER RATING STATION AT LOS ANGELES, CAL



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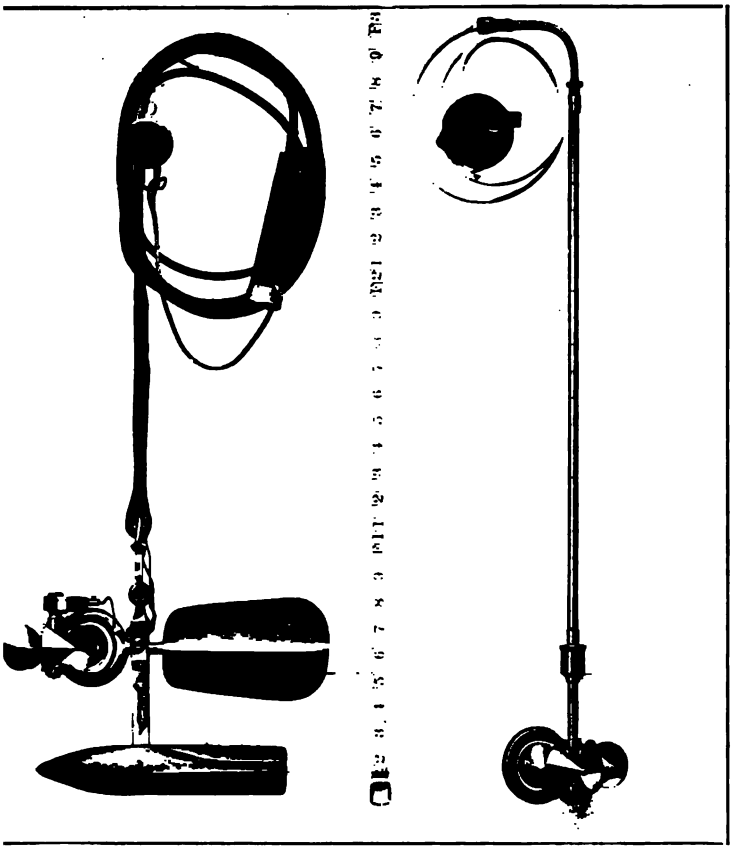


A. PRICE CURRENT METERS.

B. CURRENT-METER RATING STATION AT LOS ANGELES, CAL.

of the stream be neglected; (3) the discharge is a function of and increases gradually with the stage.

The plotting of results of the various discharge measurements, using gage heights as ordinates, and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. For the development of these curves there should be therefore a sufficient number of discharge measurements to cover the range of the stage of the stream. Fig. 2 shows a typical rating curve with its corresponding mean-velocity and area curves.

As the discharge is the product of two factors—the area and the mean velocity—any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

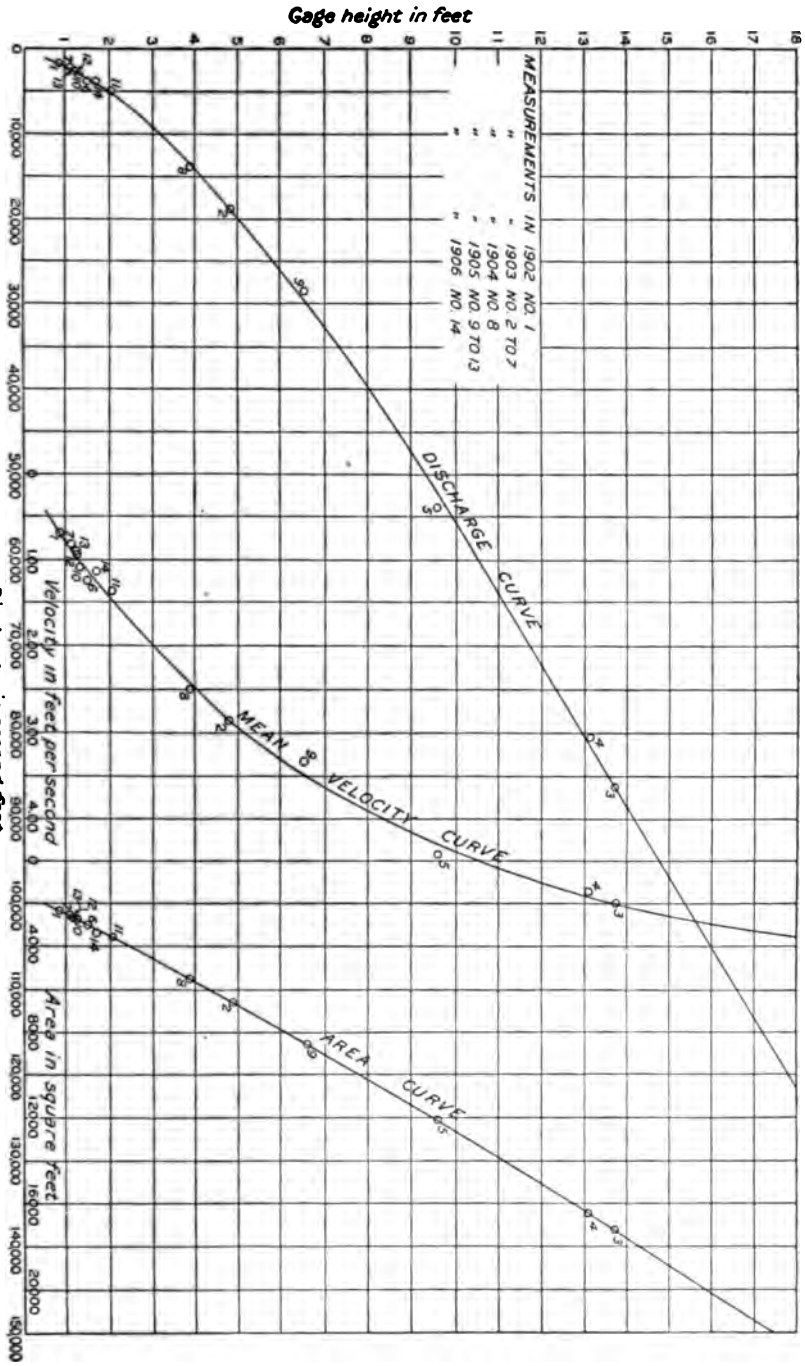
The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is always concave toward the horizontal axis or on a straight line, unless the banks of the stream are overhanging.

The form of the mean-velocity curve depends chiefly upon the surface slope, the roughness of the bed, and the cross section of the stream. Of these the slope is the principal factor. In accordance with the relative changes of these factors the curve may be either a straight line, convex or concave toward either axis, or a combination of the three. From a careful study of the conditions at any gaging station the form which the vertical velocity-curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the deter-


Gage height in feet
MEASUREMENTS IN 1902 NO. 1
" 1903 NO. 2 TO 7
" 1904 NO. 8
" 1905 NO. 9 TO 13
" 1906 NO. 14
DISCHARGE CURVE
MEAN & VELOCITY CURVE
AREA CURVE
Velocity in feet per second
Area in square feet
Discharge in second-feet

minations of flow are to be other than rough approximations. For stations with beds which shift slowly or are materially changed only during floods, rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days and the discharge for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report of the United States Geological Survey, Part IV, page 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in determining the flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Assistance has been rendered and records furnished by the following, to whom special acknowledgment is due:

H. C. Allen, special deputy State engineer, E. A. Fisher, city engineer, and J. F. Skinner, special assistant engineer, Rochester, N. Y.; Utica Consolidated Paper Company, Utica, N. Y.; A. T. Safford, consulting engineer, International Paper Company, Corinth, N. Y.; R. P. Bloss, engineer, West Virginia Pulp and Paper Company, Mechanicsville, N. Y.; G. H. Beebe, deputy city engineer, Syracuse, N. Y.; Mount Morris Paper Company, Mount Morris, N. Y.; Utica Gas and Electric Light Company; Albany and Hudson River Railroad Company; J. Waldo Smith, chief engineer, and Carlton E. Davis, resident engineer, New York Additional Water Supply Commission; Kalamazoo Valley Electric Company, Kalamazoo, Mich.; Flint Land Company, Flint, Mich.; Fletcher Paper Company, Alpena, Mich.; L. W. Anderson, city engineer, Grand Rapids, Mich.; Washtenaw Electric Company, Ann Arbor, Mich.; Gardner S. Williams, Ann Arbor, Mich.; W. E. Denison, Freeland, Mich.; Cheboygan Electric Light and Power Company, Cheboygan, Mich.; Wisconsin Geological and Natural History Survey, Dr. E. A. Birge, superintendent; and D. W. Mead, Madison, Wis.

LAKE MICHIGAN DRAINAGE.

GENERAL FEATURES.

The Lake Michigan drainage basin comprises a comparatively narrow strip of flat or gently rolling land in eastern Wisconsin, on the west shore of the lake, and a much wider strip of nearly the same character in Michigan, on the east shore. The principal streams entering the lake from the west are Fox and Menominee rivers; from

st, St. Joseph, Kalamazoo, Grand, Muskegon, and Manistee

following pages give the results of data collected during 1906 Lake Michigan drainage basin.

ESCANABA RIVER BASIN.

ESCANABA RIVER NEAR ESCANABA, MICH.

gaging station was established in May, 1903. It is located at way bridge 4 miles above the mouth of the river. The condi- at this station and the bench marks are described in Water- Paper No. 170, page 12, where are given also references to ations that contain data for previous years.

Discharge measurements of Escanaba River near Escanaba, Mich., in 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
Horton and Brennan	194	1,270	6.43	7,830
M. S. Brennan	194	882	4.17	2,880
do	194	865	4.10	2,580

[a] Heavy run of logs.

aily gage height, in feet, of Escanaba River near Escanaba, Mich., for 1906.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		4.3	3.0	3.3	2.2	2.2	2.2	2.8	3.3
		4.4	3.1	3.2	2.1	2.2	2.2	2.8	3.1
		4.5	3.2	3.0	2.1	2.2	2.2	2.7	3.0
		4.4	3.3	2.9	2.2	2.2	2.3	2.8	2.9
		4.4	3.4	2.8	2.3	2.1	2.2	2.9	2.9
		4.2	3.6	2.7	2.3	2.1	2.3	2.9	2.8
		3.9	3.7	2.6	2.1	2.2	2.3	3.0	2.8
		3.9	4.0	2.6	2.2	2.3	2.4	3.1	2.9
	4.0	4.0	4.1	2.5	2.3	2.4	2.4	3.1	2.9
	4.1	3.8	4.1	2.4	2.5	2.5	2.5	3.1	2.8
	4.3	3.7	4.0	2.4	2.4	2.6	2.5	3.0	2.8
	4.6	3.5	3.8	3.4	2.2	2.8	2.5	3.1	2.9
	5.2	3.4	3.9	3.4	2.1	2.9	2.3	3.0	2.9
	5.3	3.5	3.9	3.3	2.1	2.9	2.3	2.8	2.9
	5.3	3.4	3.7	3.4	2.3	2.9	2.4	2.8	2.9
	5.4	3.5	3.5	3.2	2.2	3.1	2.5	2.9	2.8
	5.6	3.4	3.5	3.2	2.3	3.1	2.4	2.9	2.9
	6.2	3.3	3.4	3.1	2.1	3.1	2.4	2.8	2.8
	6.5	3.2	3.3	3.0	2.1	3.0	2.3	2.7	2.8
	6.8	3.1	3.3	3.1	2.4	3.0	2.4	2.8	2.9
	6.9	3.1	3.2	2.9	2.4	2.9	2.3	2.9	2.9
	6.8	3.2	3.3	2.8	2.3	2.9	2.2	2.9	2.9
	5.9	3.3	3.4	2.7	2.2	2.8	2.2	2.8	(a)
	5.8	3.4	3.4	2.5	2.2	2.7	2.3	2.9	
	5.5	3.5	3.6	2.3	2.1	2.7	2.2	3.0	
	5.1	3.4	3.7	2.2	2.3	2.6	2.2	3.1	
	5.1	3.3	3.2	2.1	2.3	2.6	2.3	3.2	
	4.7	3.3	3.7	2.2	2.4	2.5	2.4	3.1	
	4.5	3.4	3.5	2.1	2.2	2.4	2.5	3.1	
	4.3	3.3	3.4	2.1	2.2	2.2	2.5	3.0	
		3.2		2.2	2.3		2.6		

[a] Frozen.

Rating table for Escanaba River near Escanaba, Mich., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.10	320	3.10	1,180	4.10	2,530	5.20	4,460
2.20	385	3.20	1,300	4.20	2,690	5.40	4,870
2.30	450	3.30	1,420	4.30	2,850	5.60	5,330
2.40	520	3.40	1,550	4.40	3,010	5.80	5,850
2.50	600	3.50	1,680	4.50	3,180	6.00	6,420
2.60	680	3.60	1,810	4.60	3,350	6.20	7,040
2.70	770	3.70	1,950	4.70	3,520	6.40	7,730
2.80	860	3.80	2,090	4.80	3,700	6.60	8,500
2.90	960	3.90	2,230	4.90	3,880	6.80	9,300
3.00	1,070	4.00	2,380	5.00	4,070	7.00	10,170

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906, and is well defined between gage heights 2.7 feet and 4.6 feet.

Monthly discharge of Escanaba River near Escanaba, Mich., for 1906.

[Drainage area, 800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (9–30)	9,720	2,380	5,170	6.46	5.2[illegible]
May	3,180	1,180	1,870	2.34	2.7[illegible]
June	2,530	1,070	1,750	2.19	2.4[illegible]
July	1,550	320	879	1.10	1.2[illegible]
August	600	320	411	.514	.5[illegible]
September	1,180	320	714	.892	1.0[illegible]
October	680	385	485	.606	.7[illegible]
November	1,300	770	1,000	1.25	1.4[illegible]
December (1–22)	1,420	860	964	1.20	.9[illegible]

NOTE.—Values are rated as follows: May and June, excellent; remainder of the period, good.

MENOMINEE RIVER BASIN.

MENOMINEE RIVER NEAR IRON MOUNTAIN, MICH.

This station was established September 4, 1902. It is located at the Homestead highway bridge, 3.5 miles south of Iron Mountain, Mich. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 14, where are given also references to publications that contain data for previous years.

Discharge measurements of Menominee River near Iron Mountain, Mich., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 18	Horton and Brennan	244	3,210	11.51	10,900
April 18	do	244	3,250	11.67	11,200
June 8[a]	M. S. Brennan	238	2,960	10.45	8,750
June 9[a]	do	238	2,820	9.92	8,030

[a] Discharge slightly affected by run of logs.

Daily gage height, in feet, of Menominee River near Iron Mountain, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	2.48	4.55	3.0	3.8	8.5	8.8	9.2	2.7	2.6	2.9
2	2.42	4.1	3.0	3.9	9.0	6.8	8.3	2.9	3.6	2.25
3	2.4	4.0	2.95	4.3	9.4	7.0	7.5	2.65	3.1	2.3
4	2.5	4.05	2.9	4.75	9.5	5.1	8.6	2.4	2.8	2.4
5	2.5	4.0	2.8	4.9	9.8	7.0	6.4	2.7	2.65	2.5
6	2.6	3.9	2.82	4.92	9.1	6.0	6.2	3.75	2.5	2.45
7	2.58	3.8	2.9	5.0	8.2	8.4	4.1	4.25	2.3	2.4
8	2.5	3.75	2.82	5.05	8.5	10.7	4.0	4.0	2.4	2.5
9	2.4	3.6	2.9	5.35	7.6	11.3	3.6	3.8	2.6	2.6
10	2.4	3.55	2.9	6.1	7.3	10.3	4.75	3.5	2.1	2.55
11	2.3	3.4	3.0	7.15	7.8	8.1	4.4	3.2	2.0	2.75
12	2.4	3.4	3.05	7.9	7.1	7.7	4.3	3.3	2.4	2.65
13	2.85	3.42	3.1	8.25	7.2	6.7	3.9	2.75	4.0	2.7
14	3.45	3.4	3.0	8.9	6.1	4.6	4.1	2.4	3.8	2.75
15	3.6	3.3	3.0	10.6	6.2	3.7	4.6	2.5	3.7	2.4
16	3.6	3.25	3.0	11.05	6.5	4.6	4.3	2.6	3.9	3.25
17	3.5	3.25	2.95	11.4	6.3	2.9	4.1	4.1	3.7	4.05
18	3.35	3.20	2.9	11.7	6.7	2.4	3.8	3.8	3.4	4.15
19	3.0	3.35	3.0	13.1	6.2	2.3	3.6	3.1	3.1	5.0
20	2.7	3.4	2.95	13.7	5.3	3.3	4.2	2.9	2.9	(a)
21	2.7	3.3	2.95	14.3	5.15	4.8	3.9	2.6	2.75	.....
22	2.8	3.3	3.05	14.1	4.35	4.75	3.4	2.85	3.0	.....
23	2.75	3.25	3.05	13.2	2.3	4.3	4.2	3.2	2.9	.....
24	2.8	3.25	2.95	12.15	4.5	4.2	3.9	3.6	2.8	.....
25	3.2	3.20	2.9	11.9	4.7	3.0	3.8	3.9	2.7	.....
26	4.15	3.25	3.05	10.7	5.5	2.6	3.2	4.1	2.65	.....
27	4.85	3.2	3.3	10.1	7.0	8.35	3.8	3.8	2.8	.....
28	5.3	3.05	3.4	9.6	6.7	9.0	3.6	3.6	2.75	.....
29	5.0	.....	3.45	9.4	7.7	8.8	3.4	3.5	2.7	.....
30	4.8	.....	3.55	9.2	8.3	9.1	3.0	3.25	2.8	.....
31	4.8	.....	3.6	.....	8.9	.....	2.8	2.8	.....	.....

a Gage reader left.

Rating table for Menominee River near Iron Mountain, Mich., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.00	1,540	3.30	2,432	4.60	3,396	6.80	5,230
2.10	1,606	3.40	2,503	4.70	3,474	7.00	5,420
2.20	1,672	3.50	2,575	4.80	3,552	7.20	5,615
2.30	1,739	3.60	2,647	4.90	3,630	7.40	5,815
2.40	1,806	3.70	2,719	5.00	3,708	7.60	6,025
2.50	1,874	3.80	2,792	5.20	3,865	7.80	6,235
2.60	1,942	3.90	2,866	5.40	4,023	8.00	6,450
2.70	2,011	4.00	2,940	5.60	4,183	9.00	7,630
2.80	2,080	4.10	3,015	5.80	4,345	10.00	8,930
2.90	2,150	4.20	3,090	6.00	4,510	11.00	10,250
3.00	2,220	4.30	3,166	6.20	4,680	12.00	11,660
3.10	2,290	4.40	3,242	6.40	4,860	13.00	13,100
3.20	2,361	4.50	3,319	6.60	5,040	14.00	14,600

E.—The above table is applicable only for open-channel conditions. It is based on discharge rements made during 1902-1906, and is fairly well defined.

Monthly discharge of Menominee River near Iron Mountain, Mich., for 1906.

[Drainage area, 2,420 square miles.]

Month.	Discharge in second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
January	3,940	1,740	2,370	0.979
February	3,360	2,260	2,590	1.07
March	2,650	2,080	2,250	.930
April	15,100	2,790	8,040	3.32
May	8,670	1,740	5,610	2.32
June	10,700	1,740	5,040	2.08
July	7,890	2,080	3,500	1.45
August	3,130	1,810	2,400	.992
September	2,940	1,540	2,160	.893
October (1-19)	3,710	1,710	2,140	.884

NOTE.—Values are rated as follows: January and March to October, fair. It is probable that ice conditions affected the flow during February and that the value given above is considerably in excess of the true value.

PESHTIGO RIVER BASIN.

DESCRIPTION OF BASIN.

Peshtigo River rises in the plateau region of northwestern Wisconsin at an elevation of about 1,600 feet and descends on an average about 10 feet to the mile. But few of its powers have been developed on account of this region being thinly settled. There are falls of 46 feet, 35 feet, and 25 feet at different places on the river that could easily be developed. (See Pl. III.)

PESHTIGO RIVER SURVEY.

In order to point out the power possibilities along Peshtigo River, a survey was made during 1906 from the mouth to Rat River. From the data collected on this survey sheets have been prepared showing a profile of the water surface, a plan of the river, contour along the bank, and prominent natural or artificial features.

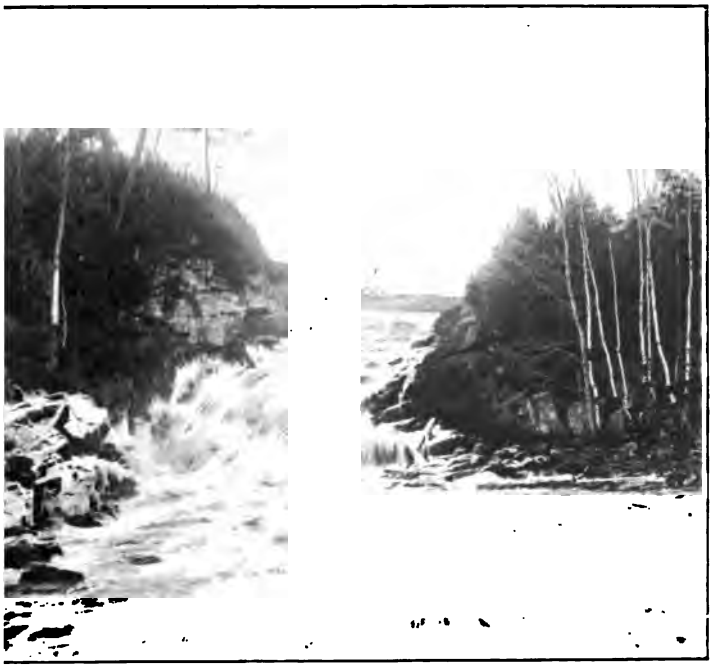
The results of this survey have been published on separate sheets and may be had upon application to the Director of the Geological Survey.

PESHTIGO RIVER AT CRIVITZ, WIS.

This station was established April 20 and was discontinued December 12, 1906. It was located on the railroad bridge about one-fourth mile south of Crivitz post-office (or Ellis Junction railroad station).

The channel is straight for about 1,000 feet above and 300 feet below the station. Both banks are of medium height and do not overflow; all the water passes the section, being confined by the railroad embankments. The bed of the stream is gravel and is permanent. There is but one channel at all stages. The current is medium. Log jams and sunken logs affect the discharge at times.

A



B

FALLS ON PEMBINE RIVER, WISCONSIN

A, [illegible] *B*, [illegible]

Discharge measurements are made from the upstream side of the bridge, to which the gage is attached.

A standard chain gage, attached to the upstream side of the bridge, was read during 1906 by Andrew Johnson; length of chain, 22.85 feet. The bench mark is the top of parapet wall of left abutment, extreme downstream end, near front face, marked with white paint; elevation, 21.52 feet. The reference point is the center of gage pulley; elevation, 22.66 feet. Elevations refer to the datum of the gage.

Discharge measurements of Peshtigo River at Crivitz, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 20	Horton and Brennan	136	897	9.88	2,520
June 8	M. S. Brennan	135	822	9.70	2,030
June 29	do	127	650	8.26	1,560

Daily gage height, in feet, of Peshtigo River at Crivitz, Wis., for 1906.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		8.9	7.9	6.2	4.3	5.7	5.7	6.7	6.9
2		8.4	6.8	6.0	5.6	6.1	5.4	6.3	7.0
3		9.5	6.7	6.1	5.0	5.5	5.2	6.7	7.4
4		7.2	6.4	6.0	4.3	6.6	4.0	6.2	6.5
5		7.9	6.7	8.5	5.3	6.6	5.4	5.7	6.2
6		8.4	7.9	7.1	5.8	6.2	5.3	5.9	6.3
7		6.6	8.5	6.8	5.8	6.2	5.4	5.9	6.5
8		7.3	8.4	6.6	6.1	5.6	5.4	5.9	6.2
9		8.2	9.7	6.8	5.9	5.6	5.2	5.8	6.0
10		6.4	9.8	6.5	5.8	4.0	5.7	5.7	6.1
11		7.1	7.4	6.1	5.7	5.5	5.3	5.9	5.8
12		5.9	6.9	6.6	5.9	5.8	5.4	6.0	6.2
13		6.7	7.7	6.2	5.5	5.7	5.6	5.9	.....
14		6.5	7.3	6.0	6.4	5.7	5.4	6.0	.....
15		7.7	8.4	6.6	5.0	5.4	5.6	6.0	.....
16		6.5	8.3	6.5	5.5	5.5	5.3	5.9	.....
17		6.5	6.2	6.8	5.2	5.8	5.4	5.9	.....
18		6.0	6.1	6.4	5.3	5.9	5.3	6.1	.....
19		6.7	6.3	6.5	5.3	6.5	5.4	5.7	.....
20	9.8	6.2	7.5	6.1	5.6	6.0	5.6	5.7	.....
21	10.4	6.5	7.5	6.6	5.3	5.8	6.6	5.8	.....
22	10.7	6.7	8.5	6.5	5.7	5.8	6.5	6.0	.....
23	10.6	6.6	8.4	5.8	5.6	5.7	6.6	5.9	.....
24	10.5	6.5	8.5	5.3	5.4	5.7	6.7	5.8	.....
25	9.9	7.1	8.5	5.4	6.2	5.9	6.8	5.8	.....
26	9.3	6.6	.....	5.7	5.2	5.7	6.9	7.0	.....
27	8.5	8.4	.....	5.7	6.1	5.9	7.5	6.8	.....
28	8.6	8.7	.....	5.7	6.0	6.4	7.3	7.2	.....
29	8.5	7.4	6.9	5.8	6.8	6.0	7.2	6.8	.....
30	8.1	7.7	7.0	5.6	6.1	5.7	6.8	6.9	.....
31		7.9	.....	5.3	6.0	.....	6.7	.....	.....

PESHTIGO RIVER AT HERMAN'S FARM, NEAR CRIVITZ, WIS.

This station was established September 7, 1906, under the direction of D. W. Mead. It is located at Herman's farm, 4½ miles west of Crivitz, Wis., in the northwest quarter of sec. 26, T. 32 N., R. 19 E.

The channel is straight for about 800 feet above the station and for 300 feet below. The banks do not overflow. The bottom of the

river is gravel and permanent. There is one channel at all st
The current is swift.

Discharge measurements are made from a boat which is hel
position by means of a rope stretched across the river.

The gage, which is read daily by Rose Herman, consists of
sections. The bench mark is a copper nail in top of a pine st
50 feet from the water's edge and about 50 feet southeast of the g
elevation, 731.70 feet above sea level and 19.82 feet above the da
of the gage.

Discharge measurements of Peshtigo River at Herman's farm, near Crivitz, Wis., in 1

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Disch
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
September 7	V. H. Reineking	128	436	3.40	
October 29	do	130	463	4.20	
November 16	do	125	380	3.20	

Daily gage height, in feet, of Peshtigo River at Herman's farm, near Crivitz, Wis., for 1

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	1
1		3.0	3.7	4.2	17	3.4	3.0	3.4	
2		2.95	3.75	4.0	18	3.45	3.05	3.5	
3		2.3	3.5	3.9	19	3.5	3.3	3.5	
4		3.25	3.4	3.9	20	3.4	3.5	3.45	
5		3.0	3.4	3.8	21	3.4	3.7	3.5	
6		3.0	3.35	3.6	22	3.4	3.8	3.3	
7	3.4	2.95	3.35	3.6	23	3.45	3.8	3.3	
8	3.2	3.0	3.4	3.5	24	3.4	3.9	3.35	
9	3.0	3.0	3.4	3.6	25	3.4	4.0	3.4	
10	3.0	3.05	3.5	3.55	26	3.4	4.1	3.8	
11	3.0	2.8	3.5	3.5	27	3.0	4.2	4.0	
12	3.15	3.2	3.45	3.3	28	3.7	4.15	4.2	
13	3.2	3.05	3.4	3.35	29	3.35	4.2	4.3	
14	3.1	3.0	3.3	3.3	30	3.15	4.0	4.25	
15	3.1	3.0	3.25	3.3	31		3.9	.....	
16	3.3	3.0	3.2	3.3					

Rating table for Peshtigo River at Herman's farm, near Crivitz, Wis., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.30	280	2.90	455	3.40	645	3.90	870
2.40	305	3.00	490	3.50	690	4.00	920
2.50	330	3.10	525	3.60	735	4.10	970
2.60	360	3.20	565	3.70	780	4.20	1,020
2.70	390	3.30	605	3.80	825	4.30	1,070
2.80	420						

NOTE.—The above table is applicable only for open-channel conditions. It is based on three disch measurements made during 1906, and is well defined between gage heights 3.2 feet and 4.2 feet.

Monthly discharge of Peshtigo River at Herman's farm, near Crivitz, Wis., for 1906

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Me
September (7-30)	780	490	
October	1,020	280	
November	1,070	565	
December	1,020	508	

NOTE.—Values for 1906 are good.

OCONTO RIVER BASIN.

DESCRIPTION OF BASIN.

conto River rises in a number of small lakes and swamps in the eau region at an elevation of about 1,530 feet above sea level descends 945 feet in its length of 87 miles. About two-thirds of total fall is in the upper 35 miles of its course. At Undershell it ns abruptly and flows nearly due east, joining Lake Michigan r Oconto. The most important water powers are found in the t 33 miles of its course, in which distance the river descends 190 t.

OCONTO RIVER AT GILLETT, WIS.

This station was established June 7, 1906. It is located at the ghway bridge about 2½ miles south of Gillett, Wis.

The channel is straight for about 200 feet above and 300 feet low the station. Both banks are low but do not overflow. The d of the stream is gravel and is permanent. The current is swift. d pier foundations at both banks may affect the flow somewhat.

A standard chain gage, which was read during 1906 by Samuel lbertson and Hattie Gilbertson, is fastened to the lower side of the idge; length of chain, 24.82 feet. The reference point is the top of wnstream board guard rail 59 feet from the initial point; elevation, .75 feet above gage datum.

Discharge measurements of Oconto River at Gillett, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ne 7	M. S. Brennan	81	359	5.95	926
ne 29	do	77	339	5.72	727

Daily gage height, in feet, of Oconto River at Gillett, Wis., for 1906.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		5.4	4.75	5.15	5.1	6.05	6.7
2		5.5	4.7	5.15	5.4	6.0	6.7
3		5.7	4.75	5.7	5.2	5.9	6.6
4		6.15	4.75	5.7	5.2	5.8	6.15
5		5.75	4.2	5.5	4.9	5.8	6.95
6		6.0	4.25	5.6	5.1	5.85	5.6
7	5.95	6.0	4.85	5.6	5.4	5.7	6.1
8	6.0	5.8	4.9	5.0	5.4	5.8	7.25
9	6.15	5.75	4.8	5.2	5.1	5.8	7.5
10	6.1	5.6	5.1	5.25	5.2	5.7	7.85
11	5.95	5.6	5.4	5.3	5.0	4.6	8.3
12	5.9	5.6	5.7	5.25	5.3	5.7	9.1
13	6.2	5.5	5.3	5.2	6.15	5.4	7.8
14	6.15	5.1	5.3	5.65	4.3	5.7	7.4
15	5.6	5.2	5.3	4.9	5.35	5.5	7.35

Daily gage height, in feet, of Oconto River at Gillett, Wis., for 1906—Continued.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	5.65	5.2	5.4	6.15	5.3	5.5	[illegible]
17	5.6	5.8	5.3	5.8	5.3	5.95	[illegible]
18	5.6	5.0	4.8	5.8	5.3	5.9	[illegible]
19	5.0	4.95	4.5	5.9	5.8	6.2	[illegible]
20	5.4	5.0	5.2	6.0	6.0	6.2	[illegible]
21	5.7	5.0	5.2	6.0	6.1	6.35	(a)
22	6.0	5.5	5.2	5.1	6.0	6.3	.....
23	6.0	5.0	5.9	5.3	6.2	6.25	.....
24	6.2	4.9	5.6	5.5	6.15	6.15	.....
25	5.85	4.85	5.8	5.5	5.9	5.7	.....
26	5.75	4.8	6.0	5.5	6.1	7.05	.....
27	5.65	4.75	6.3	5.5	6.4	7.3	.....
28	5.75	4.75	6.2	5.4	6.4	7.35	.....
29	5.75	4.4	6.1	5.05	6.7	7.3	.....
31	5.65	4.7	5.9	5.0	6.3	7.2	.....
31	.....	4.7	5.6	.....	6.1	.....	.....

a Frozen.

OCONTO RIVER AT STILES, WIS.

This station was established April 20, 1906, but was discontinued June 6, 1906, as the dam immediately above the station seriously modified the flow.

Discharge measurements of Oconto River at Stiles, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 20	Horton and Brennan	119	517	4.74	[illegible]
June 6	M. S. Brennan	120	250	2.71	[illegible]

Daily gage height, in feet, of Oconto River at Stiles, Wis., for 1906.

Day.	Apr.	May.	June.	Day.	Apr.	May.	June.
1		4.0	3.0	17		3.8	.....
2		3.8	2.4	18		4.0	.....
3		3.6	3.2	19		4.4	.....
4		3.8	2.5	20	4.9	2.6	.....
5		3.3	2.7	21	4.8	4.0	.....
6		4.5	2.8	22	4.7	4.1	.....
7		2.8	.....	23	4.4	4.0	.....
8		4.5	.....	24	4.6	4.1	.....
9		4.2	.....	25	4.6	3.3	.....
10		4.2	.....	26	4.8	3.7	.....
11		4.1	.....	27	4.6	2.8	.....
12		4.4	.....	28	4.3	3.3	.....
13		4.7	.....	29	3.8	2.3	.....
14		3.4	.....	30	3.8	3.1	.....
15		4.4	.....	31	.....	3.3	.....
16		4.2	.....				

WOLF RIVER BASIN.

DESCRIPTION OF BASIN.

Wolf River rises in a number of small lakes 25 miles south of the northern boundary of Wisconsin and flows in a general southerly direction, entering upper Fox River at a point about 10 miles west

of Lake Winnebago. In the upper half of its course the descent of Wolf River is very rapid. At the Chicago and Northwestern Railroad crossing near Lenox it has an elevation of 1,562 feet above sea level, and between this point and Shawano, 80 miles, the river falls practically 10 feet per mile. Shawano is the head of navigation; below this point the river is very sluggish, with no opportunities for water power.

WOLF RIVER AT DARROW'S BRIDGE, NEAR SHAWANO, WIS.

A station was established April 21, 1906, at Darrow's bridge, about 2 miles south of Shawano, and was discontinued June 6, 1906, as the dam above modified the flow.

A measurement was made April 21, 1906, by Horton and Brennan, with the following results:

Width, 188 feet; area, 1,350 square feet; gage height, 5.87 feet; discharge, 3,890 second-feet.

Daily gage height, in feet, of Wolf River at Darrow's bridge, near Shawano, Wis., for 1906.

Day.	Apr.	May.	June.	Day.	Apr.	May.	June.
1		4.7	4.8	17		4.8	
2		4.7	4.3	18		4.1	
3		4.5		19		4.1	
4		4.0	3.8	20			
5		4.8		21	6.1	4.2	
6				22		3.6	
7		4.6		23	5.4	3.9	
8		4.7		24	5.3	3.8	
9		4.3		25	5.0	4.2	
10		4.6		26	4.7	4.2	
11		3.5		27	4.7		
12		4.2		28	4.6	3.6	
13				29		5.2	
14		4.8		30	4.5	5.0	
15		4.8		31		4.3	
16		4.7					

WOLF RIVER AT WHITE HOUSE BRIDGE, NEAR SHAWANO, WIS.

This station was established June 6, 1906. It is located at the "White House" highway bridge, about 3½ miles north of Shawano, Wis.

The channel is straight for about 200 feet above and 500 feet below the station. Both banks are of medium height and do not overflow. The bed of the stream is gravel and is permanent. There is one channel at all stages. The current is medium swift. This station may be affected by back water from the dam about 4 miles below.

A standard chain gage, which is read daily by Albert Utke, is fastened to the guard rail on the upstream side of the bridge; length of chain, 16.25 feet. The reference point is the center of gage pulley; elevation, 16.07 feet above gage datum,

Discharge measurements of Wolf River near Shawano, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
June 6	M. S. Brennan	136	767	6.90	1,[illegible]
June 30	do	132	629	5.96	[illegible]

Daily gage height, in feet, of Wolf River near Shawano, Wis., for 1906.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1			6.5	6.5	5.8	6.8	1.7
2		6.8	6.3		5.8	6.7	(a)
3		8.2	6.4	6.5	5.9	6.6	
4		7.6	6.2	6.6	6.0		
5	6.9	7.6		6.4	6.1	6.2	
6	7.4	7.4	6.2	6.2	6.0	6.4	
7	7.7	7.3	6.2	6.1		6.8	
8	7.9		6.0	5.9	6.3	6.5	
9	7.7	7.1	5.9		6.1	6.1	
10	7.7	6.4	6.0	6.0	6.1	6.4	
11	7.1	6.5	6.7	6.4	6.4		
12	6.9	6.4		6.4	6.4	6.2	
13	7.0	6.8	6.2	6.2	6.0	5.9	
14	6.5	6.9	6.2	6.1		6.6	
15	6.8		6.0	6.3	6.1	6.3	
16	6.6	6.5	6.0		6.1	6.3	
17	6.6	6.3	6.5	7.0	6.0	6.6	
18	6.5	6.0	6.3	6.6	6.3		
19	6.7	6.2		6.6	6.3	6.7	
20	6.5	5.8	6.0	6.4	6.9	7.2	
21	6.9	6.3	5.9	6.3		7.0	
22	7.2		6.0	6.4	6.5	7.3	
23	6.8	6.4	6.3		6.3	7.3	
24		6.1	6.2	6.1	6.6	7.2	
25	6.0	5.7	6.0	6.2	6.9		
26	6.7	6.1		6.1	6.7	8.1	
27	6.6	6.2	6.7	6.0	6.7	8.1	
28	6.5	6.2	6.4	5.9		7.4	
29	6.4		7.2	5.8	6.7	7.6	
30	5.8	5.8	6.2		6.5	7.1	
31		6.0	5.8		6.6		

[a] Frozen.

ST. JOSEPH RIVER BASIN.

DESCRIPTION OF BASIN.

St. Joseph River rises at Bunday Hills, in northern Hillsdale County, Mich., flows southwestward into Indiana, turns northward at South Bend, recrosses the State line near Bertrand, and debouches into Lake Michigan at St. Joseph. The total area drained is approximately 4,586 square miles, of which 2,916 square miles are in Michigan and 1,670 square miles are in Indiana. The drainage basin contains more than 400 small lakes, varying in surface area from one-eighth of a square mile to 6 square miles. Of these, approximately 100 are in Indiana and 300 in Michigan. No storage is developed on the stream.

Elkhart River, one of the principal Indiana tributaries of the St. Joseph, drains an area of about 500 square miles, which contains large lakes and extended swamps, the principal fall of the stream occurring in its passage from marsh to marsh.

ST. JOSEPH RIVER AT MENDON, MICH.

This station is located at the Marantette Bridge, near Mendon, Mich. Daily gage heights were obtained during 1906, but are not published, owing to the following sources of errors in any estimates of flow which might be based on them: (1) Inaccuracy of discharge measurements caused by the poor natural conditions of flow; (2) backwater from dam below the station; (3) the growth of aquatic plants in the channel, which changes the relation of gage height to discharge during the summer; (4) occasional backwater from Portage Creek, which enters the St. Joseph between the gage and the measuring section and complicates the problem somewhat. This creek flows parallel to and about 1 mile distant from the St. Joseph at Mendon and was at one time diverted across the divide, affording water power with a fall of 20 feet, but this diversion has been discontinued.

A measurement was made April 19, 1906, by D. F. Mott, with the following results:

Width, 100 feet; area, 589 square feet; gage height, 228 feet; discharge, 1,590 second-feet.

ST. JOSEPH RIVER NEAR BUCHANAN, MICH.

This station was established April 1, 1901. It is located at the dam of the South Bend Electric Company, 1 mile below the village of Buchanan. The conditions at this station are described in Water-Supply Paper No. 170, page 20, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of St. Joseph River near Buchanan, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,320	6,042	3,559	4,983	3,416	2,899	1,758	1,644	1,200	684	1,862	6,481
2	3,303	5,004	3,742	5,288	3,544	2,826	2,407	1,969	1,391	1,053	1,776	3,521
3	3,377	4,108	4,508	4,798	3,802	2,399	2,326	1,841	2,187	1,527	1,484	3,810
4	3,394	3,615	5,009	4,505	2,183	2,774	1,895	1,734	1,934	1,558	946	3,202
5	3,637	3,897	6,069	4,194	2,590	2,214	2,185	1,286	1,904	1,753	1,849	2,460
6	3,270	3,196	5,581	4,108	3,126	2,745	2,127	1,834	1,807	1,648	1,838	3,887
7	2,542	2,888	5,300	4,137	3,341	2,756	2,077	1,806	2,145	1,218	1,606	5,811
8	3,521	3,245	5,145	4,060	3,077	2,574	1,924	1,366	1,787	1,674	1,507	5,978
9	3,706	4,058	5,073	4,371	2,986	3,791	2,252	2,229	1,056	2,065	1,924	5,023
10	3,204	3,656	4,841	4,722	3,014	4,542	1,917	2,705	1,464	1,338	1,846	5,558
11	2,846	3,054	4,321	4,801	2,897	5,909	1,894	4,542	1,520	1,948	839	5,685
12	2,744	3,710	4,764	4,774	2,762	5,868	2,129	2,794	1,810	1,661	1,482	5,530
13	2,701	3,823	4,420	4,520	2,271	5,525	2,012	2,835	1,556	1,505	1,773	5,503
14	2,515	3,603	4,191	4,739	2,913	5,535	2,133	2,462	1,868	1,079	1,781	5,044
15	2,840	3,824	4,036	5,161	2,929	4,829	1,712	3,806	1,868	935	1,708	5,006

Daily discharge in second-feet of St. Joseph River near Buchanan, Mich., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	1,389	1,486	1,509	4,233	3,086	4,986	2,180	1,435	1,324	1,237	1,671	4,[illegible]
17	1,[illegible]	1,[illegible]4	1,773	5,732	3,486	3,621	1,772	1,936	1,014	1,601	1,849	5,[illegible]
18	1,[illegible]	1,[illegible]	1,330	5,435	3,513	4,118	1,535	1,754	1,719	1,537	980	4,[illegible]
19	1,[illegible]	1,[illegible]	4,[illegible]	5,[illegible]	3,[illegible]	3,646	1,530	1,650	2,028	1,373	1,820	4,[illegible]
20	1,[illegible]	1,385	3,443	4,[illegible]	3,572	3,442	1,316	2,125	1,589	1,518	1,821	3,[illegible]
21	1,[illegible]	1,[illegible]	3,[illegible]	4,[illegible]	3,486	3,282	1,624	1,810	1,638	1,175	2,069	3,[illegible]
22	1,[illegible]	1,[illegible]	3,394	4,[illegible]	3,384	3,044	775	1,907	1,398	1,050	2,907	3,[illegible]
23	4,[illegible]	1,[illegible]	3,148	4,[illegible]	2,[illegible]	2,904	1,722	1,657	573	1,777	2,604	3,[illegible]
24	4,[illegible]	1,[illegible]	3,136	3,[illegible]	3,104	2,471	1,511	1,699	1,032	1,729	4,032	2,[illegible]
25	7,[illegible]	1,[illegible]	2,953	3,345	2,753	3,111	1,627	1,521	1,332	1,646	4,157	2,[illegible]
26	7,179	4,[illegible]	3,[illegible]	3,[illegible]	2,386	2,821	1,512	1,195	1,122	1,559	4,821	2,[illegible]
27	7,[illegible]	4,[illegible]	4,140	4,674	2,542	2,480	1,323	2,204	1,325	1,391	4,656	2,[illegible]
28	4,956	3,773	3,[illegible]	3,922	3,145	2,537	1,346	1,929	989	1,100	4,599	3,[illegible]
29	4,442	.....	3,528	3,380	3,145	2,303	930	1,933	1,639	1,611	4,516	3,[illegible]
30	4,[illegible]	.....	3,[illegible]	3,941	2,987	2,282	1,906	1,258	756	1,781	4,210	3,[illegible]
31	4,382	.....	3,386	.....	2,949	.....	1,631	1,479	.....	1,824	.....	3,[illegible]

Monthly discharge of St. Joseph River near Buchanan, Mich., for 1906.

[Drainage area, 3,940 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	8,650	2,520	4,400	1.12	1.2[illegible]
February	6,040	2,820	3,700	.939	.[illegible]
March	6,070	2,850	4,390	1.11	1.2[illegible]
April	6,130	3,350	4,550	1.15	1.2[illegible]
May	3,800	2,180	3,060	.777	.[illegible]
June	5,910	2,210	3,460	.878	.[illegible]
July	2,480	775	1,780	.452	.5[illegible]
August	4,540	1,200	2,030	.515	.[illegible]
September	2,190	573	1,500	.381	.[illegible]
October	2,060	684	1,470	.373	.[illegible]
November	4,820	839	2,370	.602	.6[illegible]
December	6,480	2,160	4,170	1.06	1.2[illegible]
The year	8,650	573	3,070	.780	10.5[illegible]

KALAMAZOO RIVER BASIN.

DESCRIPTION OF BASIN.

Kalamazoo River rises in southwestern Jackson County, Mich., flows in a general northwesterly direction, and enters Lake Michigan at Saugatuck. Its length is about 100 miles.

Owing to its steady regimen the Kalamazoo is of great value for water power. Within the past five years three dams and power plants have been constructed to generate electricity for electric traction. An additional plant for this purpose is now under construction at Ceresco. Water power is also used for general manufacturing purposes at Allegan, Battle Creek, Albion, and other points.

KALAMAZOO RIVER NEAR ALLEGAN, MICH.

is station was established April 4, 1901. It is located at the of the Commonwealth Power Company, in Trowbridge Town- 6 miles upstream by the river from Allegan. The conditions at station and the bench marks are described in Water-Supply r No. 171, page 22, where are given also references to publications contain data for previous years.

rily discharge, in second-feet, of Kalamazoo River near Allegan, Mich., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	1,112	1,685	1,467	2,821	1,268	1,197	603	869	641	349	812	1,251
.....	1,279	1,457	1,744	2,242	1,096	1,026	1,027	477	475	306	915	983
.....	1,157	1,218	2,612	2,039	1,156	1,011	1,112	852	411	876	1,045	1,274
.....	1,185	984	2,381	1,898	1,342	905	903	760	829	513	904	1,129
.....	1,185	1,221	2,214	1,676	1,150	1,136	1,091	632	666	446	983	864
.....	1,248	1,116	2,382	1,861	1,184	1,021	1,239	1,091	713	535	804	1,431
.....	899	1,167	2,195	1,817	1,062	999	964	1,011	925	581	904	1,902
.....	1,176	978	2,275	1,597	1,228	1,192	881	1,028	647	705	569	1,819
.....	1,034	1,045	2,061	1,562	1,089	2,533	1,154	917	379	1,052	890	1,670
.....	999	785	1,810	1,660	1,234	2,767	1,189	806	547	757	818	1,635
.....	783	961	1,609	1,177	971	2,638	1,001	877	622	525	407	1,904
.....	602	988	1,431	1,755	1,200	2,610	859	783	648	412	1,044	1,729
.....	1,105	1,189	1,590	1,805	1,064	2,729	637	1,018	563	768	983	1,525
.....	899	1,592	1,400	2,151	2,033	2,924	573	1,198	687	650	1,018	1,571
.....	1,125	1,221	1,406	2,283	2,311	2,378	517	993	557	859	807	1,634
.....	1,336	1,185	1,551	2,038	1,983	2,111	834	961	243	545	1,097	1,545
.....	1,258	1,128	1,371	2,192	1,821	1,915	954	1,061	635	537	1,321	1,351
.....	1,339	1,097	1,133	2,263	2,055	1,061	866	977	533	763	.....	1,306
.....	1,318	1,221	1,336	2,233	1,827	1,353	875	.....	799	461	.....	1,366
.....	1,553	1,218	1,307	1,856	1,691	1,444	765	.....	714	805	732	1,034
.....	2,755	1,469	1,312	1,287	1,465	1,296	793	.....	546	242	1,355	961
.....	3,454	1,473	1,118	1,755	1,124	1,344	683	496	792	778	1,699	1,061
.....	3,528	1,451	1,178	1,160	1,176	1,252	776	496	330	532	1,621	1,224
.....	2,931	1,998	1,042	1,350	1,178	1,088	761	581	853	933	1,669	1,269
.....	3,473	2,042	851	1,263	1,031	1,098	731	712	619	758	1,521	512
.....	3,557	1,653	1,612	1,327	1,101	1,089	683	718	588	567	1,487	707
.....	3,395	1,597	2,350	1,230	1,073	1,073	490	802	623	624	1,553	502
.....	3,317	1,656	2,070	1,326	1,037	1,143	445	666	697	1,009	1,525	813
.....	2,721	.....	2,247	1,073	1,131	1,085	556	616	482	1,110	1,088	988
.....	2,167	.....	2,139	1,067	1,173	1,017	1,102	765	105	1,275	1,316	1,061
.....	2,139	.....	2,616	.....	1,094	.....	1,112	471	.....	837	.....	1,304

Monthly discharge of Kalamazoo River near Allegan, Mich., for 1906.

[Drainage area, 1,470 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
y.....	3,560	602	1,810	1.23	1.42
ry.....	2,040	785	1,310	.890	.93
.....	2,620	851	1,740	1.18	1.36
.....	2,820	1,070	1,730	1.18	1.32
.....	2,310	971	1,330	.905	1.04
.....	2,920	905	1,550	1.05	1.17
.....	1,240	445	844	.574	.66
(28 days).....	1,200	471	808	.550	.57
ber.....	925	105	596	.405	.45
r.....	1,240	242	677	.461	.53
ber (28 days).....	1,700	407	1,100	.748	.78
ber.....	1,900	502	1,270	.864	1.00

REED'S SPRINGS, NEAR ALBION, MICH.

A gaging station was established at this place December 7 and 8, 1904, for the purpose of obtaining information concerning the permanence of the supply furnished to streams by the numerous springs in the moraines. It was discontinued June 30, 1906. The conditions at this station are described in Water-Supply Paper No. 171, page 24.

Gage height, in feet, and discharge, in second-feet, of Reed's springs, near Albion, Mich., for 1906.

Date.	Gage height on weir.	Discharge.	Date.	Gage height on weir.	Discharge.
	Feet.	*Sec.-feet.*		*Feet.*	*Sec.-feet.*
January 7	1.09	2.66	May 13	1.10	2.75
April 1	1.10	2.75	May 20	1.10	2.75
April 8	1.10	2.75	May 27	1.10	2.75
April 15	1.10	2.75	June 3	1.10	2.75
April 22	1.10	2.75	June 11	1.10	2.75
April 29	1.10	2.75	June 17	1.10	2.75

GRAND RIVER BASIN.

DESCRIPTION OF BASIN.

Grand River rises in the southern part of Jackson County, Mich., flows in a general northerly and northwesterly direction, and empties into Lake Michigan at Grand Haven. Its drainage area, which comprises a rich agricultural region in the south-central portion of Michigan, includes extensive swamps and marshes but comparatively few lakes. At Grand Rapids the stream passes over a limestone ledge, making a considerable fall, which has been developed for power purposes, and at Grand Ledge a similar descent occurs over sandstone.

The Grand receives a number of important tributaries, notably Flat, Thornapple, Maple, Lookingglass, and Red Cedar rivers.

GRAND RIVER AT NORTH LANSING, MICH.

This station was established March 2, 1901, and was discontinued August 4, 1906. It was located at the Seymour Street Bridge, a short distance below the North Lansing dam. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 26, where are given also references to publications that contain data for previous years.

Discharge measurements of Grand River at North Lansing, Mich., in 1906.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
20	D. L. Mott	177	966	4.90	1,780
6	Horton and Covert	183	811	[a] 5.20	1,400

[a] Uncertain.

Daily gage height, in feet, of Grand River at North Lansing, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
	3.24	4.69	3.59	5.23	2.95	3.02	2.08	2.30
	3.13	3.75	3.43	4.57	3.02	2.80	2.33	2.55
	2.98	3.44	6.08	4.33	3.39	2.27	1.93	2.35
	3.02	3.22	6.82	4.53	3.27	2.52	1.98	3.05
	3.08	4.02	6.37	3.68	2.96	2.97	2.68	.....
	3.09	3.58	6.24	4.07	2.63	2.43	2.70	.....
	2.55	3.42	5.42	4.17	2.95	2.38	2.52	.....
	2.47	3.27	4.88	4.02	2.70	5.12	2.63	.....
	2.54	3.15	4.60	4.74	2.75	9.23	2.48	.....
	2.52	3.09	3.96	5.27	2.82	9.88	2.35	.....
	2.56	2.42	4.18	5.43	2.91	8.57	2.08	.....
	2.66	2.98	3.39	5.05	2.72	7.43	2.05	.....
	2.42	2.66	3.86	4.98	2.52	6.07	2.15	.....
	2.14	3.06	3.56	5.18	3.33	5.50	2.07	.....
	2.96	3.44	3.32	6.58	4.23	4.60	2.10	.....
	3.48	3.02	3.46	6.78	4.45	4.05	2.35	.....
	3.88	2.70	3.14	6.35	3.89	3.31	2.30	.....
	3.48	2.20	2.80	5.52	3.87	3.46	2.03	.....
	3.54	2.66	3.20	5.52	3.28	3.33	2.08	.....
	3.76	2.51	2.96	4.73	3.02	2.97	2.00	.....
	5.89	3.48	2.99	4.00	2.88	3.02	2.05	.....
	7.56	3.93	2.90	4.27	2.90	2.90	2.03	.....
	8.92	3.79	2.66	3.42	2.55	2.63	2.33	.....
	9.14	3.78	2.76	3.37	2.42	2.53	2.10	.....
	8.5	3.70	2.41	3.48	2.42	2.72	2.18	.....
	7.26	4.40	3.44	3.45	2.42	2.47	2.08	.....
	6.42	3.94	5.10	3.20	1.82	2.40	2.15	.....
	5.77	3.30	6.72	3.10	3.13	2.20	2.17	.....
	5.34	.....	6.90	3.17	3.38	2.37	1.83	.....
	5.01	.....	6.36	3.23	2.97	2.17	2.33	.....
	4.61	.....	5.60	.....	3.07	.....	2.43	.....

Rating table for Grand River at North Lansing, Mich., for 1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.80	251	3.10	761	4.40	1,420	6.40	2,730
1.90	281	3.20	807	4.50	1,475	6.60	2,900
2.00	313	3.30	854	4.60	1,530	6.80	3,080
2.10	347	3.40	902	4.70	1,585	7.00	3,260
2.20	383	3.50	950	4.80	1,640	7.20	3,445
2.30	421	3.60	999	4.90	1,700	7.40	3,635
2.40	461	3.70	1,049	5.00	1,760	7.60	3,830
2.50	502	3.80	1,099	5.20	1,880	7.80	4,030
2.60	544	3.90	1,149	5.40	2,000	8.00	4,240
2.70	586	4.00	1,200	5.60	2,130	9.00	5,370
2.80	629	4.10	1,255	5.80	2,265	10.00	6,680
2.90	672	4.20	1,310	6.00	2,405		
3.00	716	4.30	1,365	6.20	2,565		

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1902-1906, and is well defined below gage heights 5.4 feet and fairly well e gage height 5.4 feet.

Monthly discharge of Grand River at North Lansing, Mich., for 1906.

[Drainage area, 1,230 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
January	5,540	361	1,610	1.31	
February	1,580	383	887	.721	
March	3,170	465	1,450	1.18	
April	3,060	761	1,530	1.24	
May	1,450	257	737	.599	
June	6,510	372	1,410	1.15	
July	586	260	392	.319	
August (1-4)	738	421	531	.432	

NOTE.—Values are rated as follows: January to March and June, good; remainder of the per excellent.

GRAND RIVER AT GRAND RAPIDS, MICH.

This station was established March 12, 1901, by L. W. Anders city engineer of Grand Rapids. It is located at the Fulton Str Bridge. The gage is read by assistants in city engineer's office.

The conditions at this station and the bench marks are describ in Water-Supply Paper No. 170, page 29, where are given also r erences to publications that contain data for previous years.

A measurement was made during 1906 at gage height 7.58 fe which indicated a discharge nearly 25 per cent in excess of the rati used for 1905. Owing to lack of data tending either to confirm discredit this measurement, it was considered inadvisable to ma estimates of flow for 1906. It is believed, however that the 19 rating probably applies correctly for 1906.

Daily gage height, in feet, of Grand River at Grand Rapids, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	.....	5.95	5.12	.....	1.85	1.32	.....	−0.08	−0.48	0.50	0.70	1
2	1.75	4.60	4.68	4.78	1.88	1.22	0.25	− .38	.....	.35	.55	...
3	2.12	2.35	5.52	4.25	1.75	.....	.28	− .35	.....	.22	.60	1
4	2.30	.....	.....	3.72	1.85	.85	.....	− .35	− .45	.12	.....	1
5	1.55	3.35	7.05	3.35	1.80	1.18	− .10	.....	− .48	.05	.32	
6	1.38	4.60	7.25	3.25	.....	1.90	− .10	− .45	− .50	− .05	.28	
7	.....	4.72	7.15	3.22	1.85	1.28	− .15	− .35	− .58	.....	.25	1
8	1.50	4.68	6.68	.....	1.45	1.20	.....	− .05	− .58	− .05	.20	1
9	1.80	4.48	5.90	3.55	1.35	1.50	+ .05	+ .40	.....	− .02	.18	...
10	1.68	4.20	5.15	4.50	1.30	.....	− .02	.60	− .60	.00	.18	...
11	1.65	.....	.....	5.05	1.20	4.22	− .15	.82	− .58	− .15	.....	2
12	1.35	3.20	4.15	5.20	1.15	4.95	− .15	.....	− .50	− .05	.00	2
13	1.25	3.00	3.70	5.18	.....	4.75	− .18	.48	− .42	− .20	.00	2
14	.....	3.35	3.25	5.35	1.95	4.30	− .18	+ .38	− .38	.....	.00	2
15	1.08	3.50	3.0	.....	1.95	3.15	.....	− .02	− .40	− .26	− .10	2
16	2.48	3.15	2.65	6.75	2.35	2.65	− .10	− .08	.....	− .28	− .10	...
17	2.45	3.10	2.32	6.95	2.50	.....	− .05	− .25	− .32	− .28	+ .40	3
18	2.20	.....	.....	7.05	2.30	1.65	− .05	− .22	− .38	− .30	.....	2
19	2.90	2.55	2.02	6.70	1.80	1.60	− .10	.....	− .35	− .25	.40	2
20	3.15	2.45	1.85	5.88	.....	1.30	− .15	− .30	− .30	− .28	.60	1
21	5.95	4.25	1.75	4.80	1.44	1.25	− .30	− .28	− .28	.....	.85	1
22	8.28	.....	1.35	.....	1.10	1.20	.....	− .32	− .22	− .28	1.70	1
23	9.78	4.80	1.25	3.65	.95	1.10	− .35	− .25	.....	− .25	2.55	...
24	10.65	5.82	1.45	3.30	.80	.....	− .35	− .18	− .05	− .28	2.85	1
25	11.50	.....	.....	2.90	.75	.62	− .40	− .30	− .30	− .15	.....	1

gage height, in feet, of Grand River at Grand Rapids, Mich., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	11.65	6.82	1.80	2.65	0.60	0.70	−0.40	.....	−0.30	−0.05	2.75	1.05
.....	11.18	6.48	3.50	2.38	.....	.70	− .38	+0.08	− .35	+ .30	2.90	.80
.....	.....	5.65	4.90	2.25	.75	.62	− .40	− .08	− .35	.....	2.55	.85
.....	9.15	.....	5.55	.....	1.05	.45	.....	− .18	+ .18	.65	.....	.45
.....	8.10	.....	5.88	1.80	.....	.40	− .02	− .35	.....	.85	2.15	.....
.....	6.98	.....	5.80	.....	1.25	.....	− .02	− .38	.....	.80	.....	2.05

MUSKEGON RIVER BASIN.

DESCRIPTION OF BASIN.

Iuskegon River drains an area 2,663 square miles in extent, lying ›ctly north of the Grand River basin. Its headwaters rise in the th-central part of the southern peninsula of Michigan, whence it ›s in a general southwesterly direction until it enters Lake Michi- . near the city of Muskegon.

'rom the vicinity of Evart to Newaygo the Muskegon flows be- ›en high banks and has a rapid fall. Levels run for the purpose w that within a distance of 10 miles—5 miles each way from Big pids—there is a total fall of 104 feet, practically all of which could economically developed, as there are favorable sites for the loca- ı of dams.

n connection with power development good opportunities exist for conservation of flow by artificial storage. The water surface areas the principal lakes of the watershed and of the tributary drainage ich they control are given below:

Drainage and surface areas of lakes in Muskegon River watershed.

Lake.	Drainage area.	Water surface.
	Sq. miles.	*Sq. miles.*
krat Lake and group	57	8.0
ı Lakes	67	6.7
;ins Lake	67	15.0
ghton Lake	185	31.0
;ins and Houghton lakes	252	46.0

n the upper portion of the watershed there is a total lake area of ›ut 110 square miles. Formerly a lumberman's dam was maintained the purpose of flooding logs between Higgins and Houghton lakes, this has been washed out. A lumberman's dam, built of logs l earth, which still remains about 1 mile below the foot of Houghton ;e, raises the water level in that lake 4 feet, providing a storage 3,350,000,000 cubic feet in round numbers.

MUSKEGON RIVER AT NEWAYGO, MICH.

This station was established in March, 1901. It is located a dam of the Newaygo Portland Cement Company, which crosse: Muskegon in a deep valley above the village of Newaygo. The ditions at this station are described in Water-Supply Paper No. page 32, where are given also references to publications that co data for previous years.

Daily discharge, in second-feet, of Muskegon River at Newaygo, Mich., for 190

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1,970	2,237	1,389	2,244	977	1,050	1,082	881	894	1,408	1,387
2	2,172	1,748	1,309	2,246	1,085	1,148	1,059	1,073	926	1,113	1,418
3	2,154	2,128	1,190	2,165	1,607	1,233	1,103	884	878	971	1,409
4	2,115	2,273	1,302	2,098	1,784	1,143	1,188	910	840	1,137	1,243
5	1,872	2,314	648	2,917	999	1,204	1,103	814	857	984	1,412
6	1,899	2,172	777	2,133	1,502	1,191	1,100	926	937	1,038	1,226
7	2,049	2,139	851	2,051	1,555	1,142	1,074	927	852	1,068	1,257
8	1,971	2,019	777	2,117	1,624	1,188	1,098	945	913	1,344	1,289
9	1,793	2,041	1,124	3,240	1,453	1,212	984	1,043	868	1,319	1,223
10	1,795	1,681	1,567	3,549	1,472	1,066	1,114	1,461	830	1,189	1,202
11	2,017	1,576	1,552	2,016	1,050	1,067	1,050	849	789	1,158	1,179
12	1,981	1,767	1,605	1,788	977	949	958	946	982	1,158	1,169
13	2,202	2,202	1,529	1,912	1,015	1,208	1,162	878	876	1,225	1,181
14	1,953	1,650	1,277	1,836	1,634	1,020	954	891	734	1,249	1,101
15	2,323	1,456	1,049	2,360	984	1,066	1,122	910	994	1,105	1,208
16	3,062	2,145	1,606	2,413	1,027	1,270	1,061	1,010	990	1,120	1,204
17	2,584	1,896	2,017	2,349	1,082	1,143	1,027	833	926	1,067	1,240
18	2,793	1,927	609	2,268	1,388	1,111	1,150	860	990	1,258	1,333
19	2,662	1,859	1,528	2,080	1,130	947	1,187	926	878	1,233	2,207
20	2,699	2,598	907	1,291	1,083	1,178	1,181	830	782	1,196	2,256
21	.....	2,577	1,946	1,284	1,115	1,176	1,102	963	1,365	1,286	2,151
22	.....	1,317	1,931	1,145	1,090	1,082	989	896	1,209	1,281	2,570
23	.....	1,294	1,627	1,079	958	1,147	1,062	838	1,322	1,186	3,055
24	.....	1,381	1,498	1,048	1,136	1,227	829	901	1,207	1,164	2,615
25	.....	1,652	1,525	912	1,255	1,082	1,014	846	906	1,313	2,628
26	.....	1,482	1,359	1,145	1,260	1,068	1,064	854	1,144	1,376	3,196
27	2,614	1,413	1,208	1,248	1,387	1,075	1,167	842	1,015	1,345	4,070
28	2,218	929	2,427	1,228	1,484	1,098	1,060	881	1,081	1,686	3,891
29	2,226	.....	2,374	907	1,223	1,002	1,104	812	1,191	1,835	3,648
30	2,109	.....	2,551	1,149	1,422	1,036	1,082	780	1,728	1,606	3,610
31	2,243	.....	2,722	.....	1,127	.....	1,159	926	.....	1,418	.....

NOTE. Ice conditions January 21 to 26.

Monthly discharge of Muskegon River at Newaygo, Mich., for 1906.

[Drainage area, 2,350 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in
January (25 days)	3,060	1,790	2,220	0.945	
February	2,600	929	1,850	.787	
March	2,720	609	1,480	.630	
April	3,550	907	1,870	.796	
May	1,780	958	1,250	.532	
June	1,270	947	1,120	.477	
July	1,190	829	1,080	.460	
August	1,460	780	914	.389	
September	1,730	734	997	.424	
October	1,840	971	1,250	.532	
November	4,070	1,100	1,960	.834	
December (29 days)	3,420	1,100	1,920	.817	

MANISTEE RIVER BASIN.

DESCRIPTION OF BASIN.

tee River is the northernmost of the group of three large aining the western part of the southern peninsula of Michigan. ts source in southeastern Antrim County, flows in a general sterly direction, and enters Lake Michigan at the city of e, an important lumber center. The harbor at the mouth of · is excellent. The fall is gradual and no important utilization vater power has been made, the principal use of the stream r rafting logs.

MANISTEE RIVER NEAR SHERMAN, MICH.

station was established July 10, 1903, at North Bridge, near n. The conditions at this station and the bench marks are d in Water-Supply Paper No. 170, page 34, where are given erences to publications that contain data for previous years. asurement was made June 30, 1906, by Horton and Covert, e following results:

68 feet; area, 409 square feet; gage height, 2.36 feet; discharge, 988 second-

ly gage height, in feet, of Manistee River near Sherman, Mich., for 1906.

Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.88	3.02	3.55	3.30	2.65	2.75	2.28	1.92	2.18	2.00	3.65
.....	2.58	2.92	3.80	3.50	2.65	2.80	2.28	1.98	2.15	2.00	3.32
.....	2.28	2.80	4.02	3.60	2.62	2.65	2.35	2.12	2.10	2.00	3.00
.....	2.35	2.80	4.35	3.80	2.60	2.45	2.30	2.15	2.02	2.00	2.72
.....	2.42	2.72	4.58	3.98	2.62	2.40	2.20	2.10	1.95	2.00	2.70
.....	2.45	2.70	4.68	3.78	2.65	2.40	2.12	2.08	1.95	2.00	2.65
.....	2.42	2.70	4.62	3.55	2.72	2.35	2.10	2.05	1.95	2.00	2.60
.....	2.32	2.68	4.60	3.50	2.72	2.30	2.10	2.00	1.95	2.00	2.60
.....	2.45	2.68	4.65	3.40	2.68	2.30	2.12	2.00	2.00	2.00	2.52
.....	4.00	2.70	4.85	3.32	2.58	2.30	2.12	1.98	2.02	2.05	2.48
.....	5.00	2.70	5.05	3.22	2.50	2.30	2.10	1.95	2.10	2.00	2.42
.....	4.68	2.68	5.15	3.18	2.42	2.30	2.10	1.92	2.08	2.00	2.52
.....	4.00	2.58	5.05	3.18	2.32	2.30	2.02	1.92	2.05	2.00	2.55
.....	3.50	2.50	5.00	3.22	2.30	2.30	2.00	1.95	2.05	2.00	2.48
.....	3.15	2.45	4.92	3.25	2.30	2.45	2.00	2.00	2.05	2.08	2.40
.....	3.02	2.45	4.90	3.22	2.30	2.80	2.00	2.00	2.05	2.10	2.38
.....	3.00	2.38	4.88	3.12	2.35	2.95	1.98	1.98	2.05	2.10	2.35
.....	3.05	2.28	4.68	3.08	2.40	3.00	1.92	1.95	2.05	2.18	2.35
.....	3.40	2.30	4.35	3.08	2.40	3.00	2.05	1.95	2.10	2.22	2.42
..... 2.65	3.35	2.35	4.15	3.10	2.40	2.85	2.18	1.90	2.10	2.35	2.30
..... 3.35	2.80	2.32	4.10	2.95	2.45	2.55	2.15	1.92	2.08	2.55	2.30
..... 4.15	2.60	2.25	4.10	2.82	2.00	2.35	2.10	1.90	2.10	2.75	2.30
..... 4.28	2.95	2.18	4.12	2.72	2.55	2.30	2.10	1.90	2.10	2.95	2.30
..... 4.05	3.45	2.08	4.08	2.70	2.50	2.30	2.10	1.90	2.10	3.08	2.30
..... 4.78	3.70	2.18	3.98	2.70	2.50	2.25	2.10	1.90	2.10	3.22	2.30
..... 4.45	3.58	2.40	3.75	2.70	2.40	2.22	2.10	1.90	2.12	3.35	2.30
..... 4.00	3.38	2.78	3.65	2.72	2.40	2.32	2.10	1.90	2.15	3.55	2.30
..... 3.42	3.15	3.12	3.45	2.80	2.40	2.35	2.10	1.90	2.15	3.68	2.30
..... 3.12	.....	3.18	3.40	2.80	2.40	2.35	2.10	2.20	2.10	3.75	2.25
..... 3.02	.....	3.25	3.32	2.80	2.35	2.35	2.10	2.20	2.08	3.78	2.22
..... 2.98	.....	3.45	.....	2.65	.....	2.30	2.00	.....	2.00	.....	2.32

n February 1 a jam of logs several miles below the station stopped the flow of slush ice, ed up several miles above the gage and froze; this ice went out February 11.

LAKE HURON DRAINAGE.

GENERAL FEATURES.

The area tributary to Lake Huron in the United States com the eastern part of the southern peninsula of Michigan. Sou Saginaw Bay the Lake Huron slope is very narrow and the b and runnels by which it is drained are only a few miles in le The so-called Thumb of the Mitten is drained chiefly by three s northward-flowing streams known as Willow, Pinnepog, and Pi rivers, which lie in a flat, marshy region. The Saginaw River sy is tributary to the bay at its head, while northward from the ba Rifle, Au Sable, and Thunder Bay rivers, streams having conside fall, excellent ground storage, and well-sustained flow. Chebo River also belongs in the Lake Huron drainage.

AU SABLE RIVER BASIN.

DESCRIPTION OF BASIN.

Au Sable River rises in southern Otsego County and follows a t ous course in a general southeasterly direction to its outlet in Huron at Oscoda, Mich. Numerous small lakes, wet sand a and undrained hollows occur. Rock outcrops are very rar stream bed being usually clay or sand. The tributaries are unin tant, nearly all the rainfall being absorbed by the porous sand a At Bamfield, about 40 miles from the outlet, following the river elevation is about 850 feet above sea level, and from this point t mouth of the stream excellent sites for water-power develop occur.

AU SABLE RIVER AT BAMFIELD, MICH.

This station was established August 27, 1902. It is located a highway bridge at Bamfield. The conditions at this station an bench marks are described in Water-Supply Paper No. 170, pag where are given also references to publications that contain dat previous years.

Daily gage height, in feet, of Au Sable River at Bamfield, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	1.0	1.6	1.8	2.5	2.0	1.8	2.0	1.5	1.1	1.1	1.1
2	1.0	1.6	1.7	2.7	2.0	1.8	1.1	1.2	1.1	1.1	1.2
3	1.1	1.4	1.7	2.95	2.0	1.8	1.1	1.1	1.2	1.1	1.2
4	1.1	1.4	1.7	3.25	2.0	1.9	1.1	1.05	1.1	1.1	1.3
5	1.0	1.4	1.6	3.6	2.0	1.8	1.1	1.05	1.1	1.1	1.2
6	1.0	2.5	1.6	3.65	2.1	1.8	1.1	1.05	1.1	1.2	1.3
7	1.0	2.2	1.6	2.9	2.0	1.8	1.1	1.05	1.1	1.2	1.2
8	1.0	2.6	1.5	3.0	2.0	1.8	1.1	1.5	1.1	1.2	1.3
9	0.9	3.0	1.5	3.1	2.1	1.8	1.1	1.5	1.1	1.1	1.3
10	0.9	2.4	1.5	3.5	2.0	1.8	2.0	1.5	1.0	1.1	1.3

gage height, in feet, of Au Sable River at Bamfield, Mich., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	0.9	2.4	1.4	3.9	2.0	1.8	1.9	1.5	1.0	1.1	1.2	3.1
.....	0.9	2.4	1.4	3.45	1.95	1.8	1.4	1.4	1.0	1.1	1.3	3.0
.....	0.9	2.4	1.3	3.45	2.05	1.7	1.4	1.4	1.0	1.1	1.2	2.9
.....	0.9	2.4	1.3	3.65	2.0	1.5	1.4	1.3	1.1	1.1	1.3	2.8
.....	1.0	2.3	1.2	3.65	2.0	1.5	1.9	1.3	1.0	1.1	1.3	2.8
.....	1.1	2.2	1.2	3.45	2.0	1.5	1.9	1.1	1.0	1.1	1.35	2.8
.....	1.1	2.0	1.2	3.0	2.1	2.3	1.9	1.1	1.0	1.2	1.55	2.8
.....	1.1	2.2	1.1	3.05	1.9	2.3	2.0	1.1	1.0	1.4	1.85	2.6
.....	1.0	2.6	1.1	2.5	1.9	2.1	1.5	1.1	1.0	1.5	2.5	2.5
.....	1.1	2.7	1.2	2.5	1.9	2.1	1.5	1.1	1.0	1.4	2.7	2.6
.....	1.3	2.7	1.2	2.7	1.9	2.0	1.5	1.3	1.0	1.3	2.75	3.0
.....	1.4	2.8	1.2	2.7	1.9	1.9	1.4	1.3	1.0	1.3	2.8	3.5
.....	2.4	2.8	1.2	2.65	1.9	1.9	1.2	1.2	1.0	1.3	2.7	4.1
.....	2.75	2.8	1.2	2.55	1.9	1.9	1.2	1.1	1.0	1.2	2.7	4.35
.....	2.2	3.0	1.4	2.45	2.0	1.95	1.1	1.2	1.0	1.3	2.6	5.0
.....	2.3	2.8	1.5	2.45	1.9	2.0	1.1	1.2	1.0	1.2	2.6	5.0
.....	2.0	2.0	1.8	2.0	1.9	2.0	1.1	1.4	1.0	1.2	2.55	5.0
.....	1.55	1.9	1.9	2.0	1.9	2.2	1.4	1.2	1.0	1.1	2.65	4.8
.....	1.6	.....	1.7	2.2	1.9	2.0	1.5	1.1	1.1	1.2	2.65	4.2
.....	1.6	.....	2.0	1.9	1.9	2.0	2.2	1.1	1.2	1.0	2.8	4.1
.....	1.6	.....	2.5	.....	1.9	.....	1.5	1.1	.....	1.0	.....	2.85

Rating table for Au Sable River at Bamfiela, Mich., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	1,050	1.70	1,460	2.50	1,960	3.60	2,810
1.00	1,100	1.80	1,520	2.60	2,040	3.80	2,970
1.10	1,140	1.90	1,570	2.70	2,110	4.00	3,130
1.20	1,200	2.00	1,630	2.80	2,190	4.20	3,300
1.30	1,240	2.10	1,700	2.90	2,260	4.40	3,480
1.40	1,300	2.20	1,760	3.00	2,340	4.60	3,650
1.50	1,340	2.30	1,830	3.20	2,490	4.80	3,840
1.60	1,400	2.40	1,900	3.40	2,650	5.00	4,020

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1902–1905, and is well defined below gage height 3.5 feet.

Monthly discharge of Au Sable River at Bamfield, Mich., for 1906.

[Drainage area, 1,420 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean	Sec.-ft. per sq. mile.	Depth in inches.
ary	2,150	1,050	1,270	0.894	1.03
uary	2,340	1,300	1,850	1.30	1.35
h	1,960	1,140	1,350	.951	1.10
l	3,050	1,570	2,280	1.61	1.80
.....	1,700	1,570	1,610	1.13	1.30
.....	1,830	1,340	1,570	1.11	1.24
.....	1,760	1,140	1,320	.930	1.07
ust	1,340	1,120	1,210	.852	.98
mber	1,200	1,100	1,120	.789	.88
ber	1,340	1,100	1,180	.831	.96
mber	2,190	1,140	1,580	1.11	1.24
mber	4,020	1,960	2,660	1.87	2.16
The year	4,020	1,050	1,580	1.11	15.11

TE.—Values are rated as excellent except in February, the figures for which are probably consid- y in excess of the true flow on account of ice conditions.

RIFLE RIVER BASIN.

DESCRIPTION OF BASIN.

Rifle River rises in the vicinity of Rose City, in northern Oge County, flows southward and southeastward, and empties into S naw Bay about 5 miles below Omer, Arenac County. Its b covering about 385 square miles, is long and narrow, having a w of about 3 miles at the mouth of the stream. The basin cont numerous small glacial lakes, but there is no controlled storage a very small percentage of natural water surface. Ramifying tr taries at the headwaters give the stream a relatively large volum the entrance of West Branch, in T. 21 N., R. 3 E. The region is and the stream is undeveloped, but it is being exploited with a to the transmission of electric power to Saginaw and Bay City.

RIFLE RIVER NEAR STERLING, MICH.

This station was established November 14, 1905. It is loc near Sterling, at Meeker's bridge, in sec. 5, T. 19 N., R. 5 E., an about 4 miles upstream from Omer, where a gaging station was merly maintained. The conditions at this station and the be marks are described in Water-Supply Paper No. 170, page 40.

A measurement was made June 18, 1906, by Horton and Co with the following results:

Width, 51 feet; area, 140 square feet; gage height, 1.70 feet; discharge, 262 se feet.

Daily gage height, in feet, of Rifle River near Sterling, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.40	3.35	5.10	5.50	2.38	1.87	2.80	1.39	1.38	1.80	1.85
2	2.28	2.85	4.70	5.38	2.32	1.82	2.52	1.38	1.38	1.72	1.77
3	2.46	3.65	4.71	5.48	2.29	1.78	2.29	1.36	1.48	1.52	1.70
4	2.65	3.70	5.11	5.65	2.22	1.78	2.10	1.30	1.42	1.47	1.66
5	2.56	3.82	4.95	5.40	2.11	2.00	2.00	1.28	1.40	1.48	1.70
6	2.49	4.05	4.72	4.68	2.08	1.94	1.70	1.28	1.36	1.45	1.79
7	2.50	3.65	4.65	4.43	2.04	2.02	1.70	1.40	1.28	1.51	1.64
8	2.50	3.69	4.48	4.30	2.00	2.28	1.61	1.41	1.32	1.50	1.64
9	2.60	3.58	4.65	5.25	2.26	2.12	1.60	1.38	1.25	1.55	1.54
10	2.80	3.35	4.70	6.12	2.25	1.95	1.62	1.36	1.24	1.51	1.60
11	2.72	3.22	4.55	6.65	2.20	2.32	1.57	1.31	1.26	1.44	1.70
12	2.75	3.31	4.40	4.99	2.35	1.71	1.58	1.29	1.23	1.46	1.58
13	2.58	3.48	4.21	4.50	3.35	1.66	1.53	1.26	1.32	1.40	1.50
14	2.74	3.35	4.05	5.10	3.25	1.65	1.42	1.24	1.26	1.40	1.51
15	2.72	3.34	3.78	6.65	2.84	1.60	1.42	1.22	1.24	1.33	1.58
16	3.09	3.38	3.88	6.20	2.65	1.62	1.80	1.25	1.33	1.38	1.50
17	3.10	3.42	3.45	4.65	3.10	1.72	1.70	1.22	1.31	1.40	1.61
18	2.96	3.50	3.52	4.18	3.12	1.72	1.59	1.21	1.24	1.40	2.01
19	3.01	3.55	3.65	3.85	2.72	1.72	1.55	1.26	1.23	1.75	2.36
20	2.95	3.60	3.65	3.50	2.40	1.69	1.50	1.45	1.24	1.80	2.26
21	3.50	4.50	3.46	3.18	2.30	1.70	1.60	1.76	1.31	1.76	2.18
22	5.25	4.54	3.45	3.03	2.14	1.72	1.55	1.65	1.45	1.64	3.75
23	6.20	4.48	3.50	3.20	2.09	1.70	1.51	1.86	1.49	1.54	3.65
24	5.20	5.35	3.45	3.03	2.01	1.61	1.48	2.15	1.47	1.65	3.00
25	4.60	6.64	3.34	2.93	1.94	1.54	1.39	1.76	1.32	2.01	2.55

ly gage height, in feet, of Rifle River near Sterling, Mich., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.32	6.65	3.90	2.74	2.08	1.56	1.30	1.78	1.27	2.05	3.48	2.42
.....	4.12	5.90	5.92	2.53	2.18	2.15	1.37	2.04	1.32	2.22	5.14	2.47
.....	4.08	5.44	5.84	2.44	2.15	2.65	1.50	1.80	1.27	2.40	4.14	2.36
.....	3.78	.....	6.40	2.62	1.96	2.75	1.52	1.64	1.90	2.29	3.55	2.41
.....	3.68	.....	6.79	2.52	1.91	2.50	1.58	1.48	2.30	2.15	3.10	2.45
.....	3.58	.....	7.20	.....	1.90	.....	1.51	1.41	.....	2.00	.....	4.08

TE.—The following ice conditions prevailed during 1906: January 15, ice along both shores, open nel in midstream above and below gage; January 31, ice along both shores from 4 to 10 inches thick, nel open; February 15, river frozen at gage, open above and below, ice 12 inches thick; February ver frozen at gage, open above and below, ice 10 inches thick; March 15, river frozen at gage, small open above and below the section, ice 12 inches thick; March 31, ice all gone.

SAGINAW RIVER BASIN.

DESCRIPTION OF BASIN.

Three streams—Tittabawassee, Shiawassee, and Cass rivers—ite near Saginaw to form Saginaw River, the combined catchment as receiving the drainage from a crescent-shaped region of about 00 square miles surrounding Saginaw Bay.

Tittabawassee River, the northernmost of the three, drains a rela-ely flat region. From railroad profiles it is estimated that the fall the stream from Highwood to its mouth, a distance of about 50 les along the river, is 140 feet.

TITTABAWASSEE RIVER AT FREELAND, MICH.

This station was established August 22, 1903, discontinued August 1906, and reestablished October 28, 1906. It is located at the eeland highway bridge, 10 miles northwest of Saginaw, in sec. 21, 13 N., R. 3 E., one-half mile from Freeland. The conditions at is station and the bench marks are described in Water-Supply aper No. 170, page 42, where are given also references to publica-ons that contain data for previous years.

Discharge measurements of Tittabawassee River at Freeland, Mich., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ril 21.....	D. L. Mott.....	238	2,030	5.58	4,420
ne 19.....	Covert and Horton.....	213	927	2.08	764

Daily gage height, in feet, of Tittabawassee River at Freeland, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
.....	3.62	7.98	13.22	8.58	3.60	3.18	2.38	1.74	.....	3.0	6.5
.....	3.62	7.38	12.32	7.80	3.52	2.90	2.00	1.78	.....	2.8	6.25
.....	3.58	6.68	11.50	7.45	3.52	2.72	1.98	2.00	.....	2.75	6.0
.....	3.52	6.05	11.85	7.00	3.45	2.58	1.90	.....	.....	2.6	5.9
.....	3.49	5.95	12.45	7.65	3.28	2.50	1.85	.....	.....	2.6	5.15

Daily gage height, in feet, of Tittabawassee River at Freeland, Mich., in 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
6	3.42	5.82	12.20	7.48	3.12	2.52	1.90	.....	.....	2.55	4.15
7	3.32	5.78	11.68	6.02	3.00	2.52	1.95	.....	.....	2.5	5.2
8	3.29	5.65	11.22	6.52	2.88	2.62	1.82	.....	.....	2.45	5.6
9	3.25	5.60	11.00	7.55	3.30	2.75	1.72	.....	.....	2.4	6.0
10	3.22	5.48	10.95	10.43	3.22	2.88	1.68	.....	.....	2.3	6.2
11	3.19	5.18	10.52	10.60	3.35	2.75	1.72	.....	.....	2.2	6.45
12	3.15	4.92	10.05	9.70	3.48	2.48	1.62	.....	.....	2.2	6.1
13	3.12	4.60	9.38	8.85	3.80	2.28	1.50	.....	.....	2.15	6.05
14	3.10	4.48	8.92	8.75	5.20	2.18	1.55	.....	.....	2.1	7.2
15	3.18	4.40	8.62	10.50	5.00	2.08	1.68	.....	.....	2.1	7.35
16	3.40	4.22	8.22	11.30	5.15	2.00	1.75	.....	.....	2.0	7.5
17	3.92	4.00	7.92	10.00	4.65	2.00	1.82	.....	.....	2.0	7.75
18	4.58	4.08	7.62	8.42	4.32	2.00	1.92	.....	.....	2.2	7.0
19	4.08	4.18	7.42	7.30	3.80	1.75	1.78	.....	.....	3.8	6.4
20	4.22	4.30	7.30	6.18	3.10	2.00	1.68	.....	.....	4.05	5.3
21	5.70	6.40	7.45	5.62	2.85	2.00	1.70	.....	.....	5.3	4.65
22	10.08	8.90	7.12	5.28	2.70	2.00	1.65	.....	.....	6.8	4.5
23	13.70	9.95	6.72	5.02	2.60	2.00	1.62	.....	.....	7.1	4.1
24	14.62	10.20	6.38	4.88	2.78	2.05	1.58	.....	.....	6.45	3.9
25	14.20	11.05	6.62	4.65	2.95	2.00	1.50	.....	.....	5.2	3.75
26	13.65	14.90	7.30	4.40	3.38	2.00	1.51	.....	.....	5.85	3.5
27	13.18	14.95	10.65	4.32	3.65	2.08	1.50	.....	.....	6.9	3.45
28	12.30	13.90	13.48	3.85	3.88	2.12	1.58	.....	2.6	7.0	3.35
29	10.98	.....	12.20	3.82	4.05	2.18	1.75	.....	3.0	6.95	3.3
30	9.90	.....	9.90	3.72	3.82	2.10	1.74	.....	3.2	6.9	3.25
31	8.82	.....	9.18	.....	3.45	.....	1.70	.....	3.6	.....	6.0

NOTE.—Ice conditions probably affected the flow to some extent from January 21 to March 29. The high stages during this period were caused by ice jams. The ice passed out at noon, March 29.

LAKE ERIE DRAINAGE.

GENERAL FEATURES.

That portion of the Lake Erie drainage basin that lies within the United States, exclusive of Lakes Superior, Michigan, and Huron, covers the northern third of Ohio, a small corner of northeastern Indiana, and a similar area in southeastern Michigan. South of the lake the drainage area is narrow, the divide lying in places scarcely 50 miles back from the lake shore. To the west the width of the area is greater, and the Maumee, which enters the lake near Toledo, is the largest stream of northern Ohio. The average altitude of the watershed above Lake Erie is 500 feet, but the head of the Maumee at Fort Wayne, Ind., is only 170 feet above the lake. The surface is level or gently rolling.

The principal streams are Huron and Raisin rivers, which enter the lake from the Michigan corner, and Maumee, Black, and Cuyahoga rivers, which enter from Ohio. Of these, the Maumee, formed by the junction of St. Marys and St. Joseph rivers at Fort Wayne, Ind., is the most important.

HURON RIVER BASIN.

DESCRIPTION OF BASIN.

Huron River rises near the central part of Oakland County, Mich., ows southwestward, then southeastward, and is tributary to the 'est end of Lake Erie near the mouth of Detroit River. The Huron eceives the drainage from an irregularly shaped basin having its greatt length parallel to and lying at a distance of 25 to 30 miles from etroit River. This basin is connected with Lake Erie by a long, narw valley, averaging 5 miles in width, extending from a point near psilanti southeastward to Lake Erie, a distance of 28 miles. In this ortion of its course a large part of the total fall of the river occurs. he conditions are thus nearly ideal for the development of water ower, in that nearly the entire catchment area, all the large tribuaries, and an extensive area affording lake and ground storage lie bove the head of this narrow valley.

The northern portion of the main catchment area is rolling and its opography is complex. The stream flows through a series of lakes, nd north of Dover the entire basin is largely composed of lakes and urrounding marshes. In the vicinity of Ann Arbor the topography s very rolling. The stream has here a broad, flat valley, bordered by abrupt hills ranging in height from 100 to 200 feet. The channel is ortuous and changeable. Numerous abandoned sections remain as ayous. Large springs issue from the morainal hills.

Below Ypsilanti the drainage basin is flat, the soil, comparatively eavy and impervious, is mostly under cultivation, and the groundwater level is controlled by numerous drain trenches.

HURON RIVER AT DEXTER, MICH.

This station was established September 1, 1904. It is located just above the highway bridge in the village of Dexter. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 44, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of Huron River at Dexter, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.40	2.52	1.60	2.08	1.40	1.42	0.90	1.25	0.85	0.90	1.20	1.40
2	1.40	2.42	1.60	2.40	1.45	1.32	.90	1.15	.85	.85	1.20	1.35
3	1.45	2.30	2.05	2.00	1.42	1.22	.90	1.10	.80	.85	1.15	1.35
4	1.60	2.12	2.15	1.95	1.40	1.20	.90	1.10	.80	.85	1.15	1.3
5	1.52	2.00	1.98	1.90	1.35	1.15	1.00	1.08	.80	.95	1.15	1.35
6	1.45	1.92	1.90	1.90	1.35	1.15	.95	1.08	.75	.95	1.15	1.80
7	1.35	1.82	1.85	1.85	1.30	1.25	.95	1.00	.75	.95	1.15	2.00
8	1.40	1.68	1.80	1.80	1.25	1.52	.95	1.00	.70	.95	1.15	1.98
9	1.40	1.58	1.78	2.10	1.40	1.75	.95	1.00	.70	1.00	1.12	1.88
10	1.40	1.48	1.75	2.20	1.35	1.80	.95	1.05	.70	1.00	1.10	1.82

Daily gage height, in feet, of Huron River at Dexter, Mich., for 1906—Continued

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
11	1.35	1.38	1.72	2.18	1.30	1.72	0.95	1.08	0.70	1.00	1.10
12	1.35	1.35	1.70	2.10	1.30	1.62	.95	1.00	.70	1.00	1.05
13	1.30	1.35	1.70	2.08	1.30	1.52	.95	.95	.70	1.00	1.05
14	1.30	1.35	1.65	2.30	1.80	1.42	.95	.90	.65	1.00	1.05
15	1.35	1.35	1.60	2.60	2.20	1.35	.92	.90	.65	1.00	1.05
16	1.65	1.32	1.55	2.55	1.90	1.30	.90	.90	.65	.95	1.05
17	1.58	1.30	1.52	2.48	1.70	1.30	.90	.85	.65	.95	1.08
18	1.50	1.28	1.42	2.32	1.52	1.30	.85	.82	.65	.95	1.10
19	1.50	1.20	1.42	2.22	1.50	1.30	.85	.80	.65	.95	1.10
20	1.70	1.20	1.38	2.12	1.42	1.30	.80	.80	.65	.95	1.15
21	2.50	1.40	1.32	1.98	1.32	1.25	.80	.80	.65	.90	1.35
22	3.30	1.40	1.30	1.88	1.30	1.20	.80	.80	.68	.90	1.50
23	3.40	1.40	1.30	1.80	1.35	1.20	.90	.80	.70	.90	1.50
24	3.35	1.45	1.28	1.75	1.50	1.15	.88	.80	.70	.92	1.50
25	3.25	1.80	1.25	1.70	1.42	1.15	.82	.80	.68	1.00	1.50
26	3.05	1.80	1.32	1.68	1.35	1.10	.80	.85	.65	1.02	1.50
27	2.98	1.72	2.10	1.62	1.40	1.10	.75	.85	.65	1.10	1.50
28	2.92	1.65	2.48	1.58	1.85	1.05	.75	.85	.65	1.15	1.48
29	2.82	.....	2.40	1.55	1.88	1.00	1.15	.85	.75	1.15	1.45
30	2.72	.....	2.28	1.45	1.75	.95	1.48	.85	.88	1.15	1.42
31	2.62	.....	2.18	.....	1.55	.....	1.38	.80	.....	1.20	.....

HURON RIVER AT GEDDES, MICH.

A record of the depth of overflow at the dam and of the run of water wheels in the adjacent electric plant has been maintained Geddes by the Washtenaw Electric Company since February 1, 19 The conditions at this station are described in Water-Supply Pa No. 170, page 45, where are given also references to publicati that contain data for previous years.

Monthly discharge of Huron River at Geddes, Mich., for 1906.

[Drainage area, 757 square miles.]

Month.	Mean discharge in second-feet.	Run-off.	
		Sec.-ft. per sq. mile.	Dept inch
January	686	0.906	
February	426	.563	
March	515	.680	
April	620	.819	
May	454	.600	
June	322	.425	
July	148	.196	
August	156	.206	
September	83.6	.110	
October	139	.184	
November	272	.359	
December	447	.591	
The year	356	.470	

HURON RIVER AT FLATROCK, MICH.

This station was established August 6, 1904. It is located at t highway bridge below Metler's dam at Flatrock, Mich., about 8 mi above the mouth of the stream. The conditions at this station a the bench marks are described in Water-Supply Paper No. 170, pa

where are given also references to publications that contain data previous years.

Discharge measurements of Huron River at Flatrock, Mich., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
23	D. L. Mott	100	430	3.68	944
15	Horton and Covert	100	270	2.22	509

Daily gage height, in feet, of Huron River at Flatrock, Mich., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
		4.85	2.8	4.1	2.8	2.6	1.25	1.9	1.0	1.05	1.7	2.3
		4.35	3.0	4.0	2.65	2.25	1.15	1.65	.7	.....	1.8	2.1
		5.65	3.0	4.1	2.7	2.05	1.0	1.35	1.05	1.1	1.85	2.05
		6.0	4.4	3.9	2.65	1.75	1.6	1.35	.85	1.3	1.65	2.1
		5.7	4.5	3.85	2.7	1.9	1.45	1.35	1.15	1.0	1.6	1.9
		5.3	4.0	3.9	2.4	1.75	2.25	1.1	1.1	1.1	1.85	3.45
		5.1	3.8	3.8	2.1	1.75	2.05	1.55	1.0	1.2	1.75	4.9
		5.0	3.6	3.65	2.35	1.6	1.5	1.4	.85	1.3	1.65	4.8
		4.85	3.65	3.8	2.2	3.15	1.0	1.35	.85	1.4	1.55	4.2
		4.65	3.55	4.6	2.35	3.85	1.5	1.35	.85	1.3	1.45	3.85
		4.05	3.5	4.55	2.45	3.35	1.4	1.4	.7	1.25	1.5	3.5
		3.6	3.35	4.5	2.25	3.25	1.4	1.3	1.0	1.35	1.5	3.25
		3.95	3.4	4.25	2.15	2.95	1.25	1.25	.75	1.35	1.6	3.15
		3.6	3.15	4.2	3.25	2.65	1.25	1.5	.7	1.15	1.5	3.4
		3.45	3.05	4.9	4.5	2.35	1.05	1.4	.8	1.15	1.5	3.75
		3.0	2.85	5.3	4.5	2.2	1.1	1.0	.7	1.25	1.45	3.75
		3.05	2.7	5.15	4.35	2.25	1.15	1.05	.65	1.2	1.35	3.45
		3.0	2.65	4.65	3.6	2.05	1.25	.95	.6	1.2	1.4	3.2
		2.8	2.45	4.25	3.0	2.35	1.15	1.0	.85	1.25	1.6	2.65
	3.1	3.3	2.65	4.05	2.55	2.0	1.0	.95	.75	1.15	1.75	3.7
	3.75	3.3	2.4	3.95	2.35	2.0	1.1	1.0	.8	1.1	2.35	5.15
	5.85	3.6	2.4	3.8	2.5	1.85	.95	1.15	.65	1.05	3.0	5.65
	6.85	3.5	2.25	3.6	2.1	1.65	1.0	1.1	.6	1.2	3.2	4.1
	7.05	3.2	1.85	3.6	2.15	1.7	1.25	1.2	.85	1.3	3.0	4.1
	6.45	3.0	2.15	3.3	2.3	1.3	1.2	1.4	.7	1.35	2.6	4.3
	5.9	3.4	2.05	3.25	2.4	1.8	1.05	1.1	.65	1.35	2.7	4.2
	5.55	3.75	3.45	3.2	2.25	1.65	1.1	1.05	.8	1.3	2.65	4.25
	5.4	3.4	5.1	2.9	2.3	1.45	1.15	1.1	.75	1.35	2.5	4.15
	5.3	.....	5.0	2.85	3.3	1.25	1.35	1.3	.85	1.5	2.35	3.7
	5.3	.....	4.85	2.7	3.6	1.35	1.8	1.15	1.05	1.9	2.35	3.5
	5.05	.....	4.35	.....	3.05	.....	2.05	1.1	.....	1.75	.....	4.65

TE.—The flow is somewhat affected by ice during the winter months; slush ice is noted on Febru- and anchor ice on March 21.

Rating table for Huron River at Flatrock, Mich., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.60	141	1.90	401	3.20	722	5.00	1,261
0.70	158	2.00	424	3.30	748	5.20	1,331
0.80	176	2.10	447	3.40	774	5.40	1,403
0.90	194	2.20	471	3.50	801	5.60	1,476
1.00	213	2.30	495	3.60	828	5.80	1,550
1.10	232	2.40	519	3.70	856	6.00	1,624
1.20	252	2.50	543	3.80	884	6.20	1,699
1.30	272	2.60	568	3.90	913	6.40	1,775
1.40	293	2.70	593	4.00	942	6.60	1,852
1.50	314	2.80	618	4.20	1,002	6.80	1,930
1.60	335	2.90	644	4.40	1,064	7.00	2,010
1.70	357	3.00	670	4.60	1,128	8.00	2,416
1.80	379	3.10	696	4.80	1,194		

TE.—The above table is applicable only for open-channel conditions. It is based on discharge irements made during 1904–1906, and is well defined between gage heights 0.3 foot and 2.6 feet.

Monthly discharge of Huron River at Flatrock, Mich., for 1906.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
January (20-31)	2,030	696	1,439
February	1,620	618	967
March	1,300	390	738
April	1,370	593	938
May	1,100	447	617
June	898	262	462
July	483	204	277
August	401	204	263
September	242	141	190
October	401	213	239
November	722	282	419
December	1,490	401	839

NOTE.—Values are good.

MAUMEE RIVER BASIN.

DESCRIPTION OF BASIN.

Maumee River is formed at Fort Wayne, Ind., by the junction of St. Joseph and St. Marys rivers and flows northeastward into Lake Erie at Toledo. The chief tributaries are Auglaize and Tiffin rivers. The total drainage area is 6,723 square miles.

MAUMEE RIVER NEAR SHERWOOD, OHIO.

This station was established May 19, 1903, and was discontinued July 21, 1906. It is located at the highway bridge 2.5 miles south of Sherwood, Ohio, and 200 feet upstream from the Cincinnati Northern Railroad bridge. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 50, where are given also references to publications that contain data for previous years.

Discharge measurements of Maumee River near Sherwood, Ohio, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec. ft.*
February 11 [a]	Brennan and Kriegsman	236	597	3.34	456
March 8	E. F. Kriegsman	248	1,060	4.57	1,920
April 5	do	266	1,540	6.51	3,300
May 12	do	242	470	2.30	482

[a] River entirely frozen over; average thickness of ice, 0.6 foot; gage height to top of ice, 3.39 feet.

Daily gage height, in feet, of Maumee River at Sherwood, Ohio, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	4.4	5.3	5.0	10.5	3.0	2.6	2.45
2	4.0	5.2	3.8	10.1	2.9	2.5	2.45
3	3.72	5.2	3.9	9.5	2.7	2.4	2.5
4	3.7	5.3	5.3	7.2	2.7	2.35	2.6
5	4.2	.....	5.8	6.5	2.6	2.3	2.6
6	4.4	.....	5.6	6.0	2.6	2.25	2.5
7	4.6	.....	5.1	5.6	2.6	2.2	2.5
8	5.0	.....	4.6	5.2	2.5	2.25	2.5
9	5.4	.....	4.2	5.2	2.4	2.4	2.5
[illegible]	5.6	.....	4.1	8.5	2.4	2.55	2.7

ly gage height, in feet, of Maumee River at Sherwood, Ohio, for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
	5.6	.....	4.0	7.6	2.35	2.6	3.55
	5.6	.....	3.9	6.4	2.3	4.2	3.5
	5.6	.....	3.8	5.8	2.25	5.2	3.3
	5.6	.....	3.6	6.3	2.2	4.8	3.2
	5.5	4.6	3.3	7.8	2.2	4.6	3.1
	5.4	.....	3.2	7.2	2.15	4.4	3.0
	5.2	.....	3.1	6.9	2.1	4.0	3.0
	5.1	.....	3.1	6.4	2.1	3.6	3.0
	5.3	3.5	3.0	5.9	2.5	3.35	2.95
	6.2	.....	3.0	5.0	2.5	3.1	2.9
	8.1	.....	2.9	4.4	2.45	3.0	2.8
	9.0	.....	2.9	4.0	2.3	2.8	.....
	10.7	.....	2.9	3.6	2.2	3.2	.....
	10.1	3.2	2.8	3.3	2.15	3.0	.....
	9.6	3.3	2.8	3.4	2.15	2.85	.....
	9.0	3.3	2.8	4.3	2.15	2.7	.....
	8.1	4.4	6.32	3.8	2.15	2.6	.....
	7.3	5.3	12.8	3.4	2.15	2.55	.....
	5.9	.....	13.0	3.3	2.2	2.5	.....
	5.5	.....	11.6	3.2	2.3	2.5	.....
	5.3	.....	11.2	.....	2.65	.....	.....

TE.—The river was frozen January 9 to 19 and February 5 to 24; ice was about 0.5 foot thick Feb-y 15 to 19.

Rating table for Maumee River near Sherwood, Ohio, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.10	370	3.40	1,120	4.70	2,000	7.00	3,770
2.20	425	3.50	1,180	4.80	2,070	7.20	3,930
2.30	480	3.60	1,240	4.90	2,140	7.40	4,090
2.40	535	3.70	1,300	5.00	2,210	7.60	4,270
2.50	590	3.80	1,370	5.20	2,350	7.80	4,450
2.60	645	3.90	1,440	5.40	2,490	8.00	4,630
2.70	700	4.00	1,510	5.60	2,650	9.00	5,530
2.80	760	4.10	1,580	5.80	2,810	10.00	6,470
2.90	820	4.20	1,650	6.00	2,970	11.00	7,470
3.00	880	4.30	1,720	6.20	3,130	12.00	8,570
3.10	940	4.40	1,790	6.40	3,290	13.00	9,680
3.20	1,000	4.50	1,860	6.60	3,450		
3.30	1,060	4.60	1,930	6.80	3,610		

OTE.—The above table is applicable only for open-channel conditions. It is based on three dis-rge measurements made during 1906, and the form of the 1905 curve. It is well defined below gage ht 6.5 feet.

Monthly discharge of Maumee River near Sherwood, Ohio, for 1906.

[Drainage area, 2,190 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
uary [a]	7,170	.....	2,730	1.25	1.44
uary [a]	2,420	.....	1,030	.470	.49
ch	9,680	760	2,400	1.10	1.27
l	6,970	1,000	2,980	1.36	1.52
	880	370	527	.241	.28
	2,350	425	930	.425	.47
(1-21)	1,210	562	787	.350	.28

[a] **January and February corrected for effect of ice conditions.**

TE.—Values are rated as follows: January and February, fair; March to July, good.

ST. JOSEPH RIVER AT FORT WAYNE, IND.

This station was established March 20, 1905, and was discontin July 20, 1906. It was located on the first highway bridge, ab 1 mile above the junction with St. Marys River. The gage was r during 1906 by S. F. Mills. The conditions at this station and bench marks are described in Water-Supply Paper No. 170, page

Discharge measurements of St. Joseph River at Fort Wayne, Ind., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Di cha
		Feet.	*Sq. ft.*	*Feet.*	*Se*
February 11 [a]	Brennan and Kriegsman	70	270	2.59	
March 9	E. F. Kriegsman	163	448	3.40	
April 4	do	165	549	3.84	
May 10	do	154	269	2.24	
June 29	do	152	233	2.04	

[a] Ice along edges. The flow was diminished by about 65 per cent of the open-channel rating.

Daily gage height, in feet, of St. Joseph River at Fort Wayne, Ind., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Ju
1	3.0	3.55	3.05	8.05	2.45	2.2	
2	2.9	3.25	3.0	6.9	2.4	2.1	
3	2.75	2.85	3.5	5.2	2.35	2.05	
4	3.3	2.7	4.9	4.85	2.35	2.0	
5	3.6	2.7	4.75	3.4	2.5	2.0	
6	3.25	3.1	4.35	3.45	2.55	2.0	
7	3.3	2.9	4.05	3.55	2.4	1.95	
8	3.25	2.8	3.75	3.15	2.3	1.95	
9	3.05	2.7	3.4	4.5	2.25	3.05	
10	2.9	2.6	3.3	5.05	2.25	4.55	
11	2.85	2.4	3.35	4.55	2.2	4.45	
12	2.65	2.35	3.25	4.05	2.15	4.15	
13	2.55	2.15	3.05	3.75	2.15	4.0	
14	2.35	2.2	2.9	3.9	2.1	3.95	
15	2.3	2.5	2.85	5.95	2.1	3.7	
16	2.55	2.55	2.75	5.7	2.1	3.25	
17	2.75	2.55	2.75	5.0	2.35	3.0	
18	2.75	2.1	2.45	4.55	2.65	2.8	
19	2.95	2.05	2.45	4.1	2.55	2.55	
20	2.75	2.0	2.3	3.65	2.3	2.45	
21	4.1	2.05	2.6	3.3	2.25	2.75	....
22	7.3	2.2	2.25	3.0	2.1	2.8	....
23	8.0	2.2	2.45	2.9	2.05	2.6	....
24	7.95	2.3	2.4	2.75	2.05	2.35	....
25	7.1	2.85	2.4	2.65	2.0	2.25	....
26	6.45	3.55	3.4	3.6	2.0	2.2	....
27	6.1	3.7	7.7	3.0	2.35	2.1	....
28	5.2	3.25	9.15	2.9	2.75	2.05	....
29	4.55	.....	8.55	2.75	2.5	2.05	....
30	4.0	.....	7.9	2.55	2.35	2.1	....
31	3.7	.....	8.65	.....	2.3	.....	....

NOTE.—Flow affected by ice conditions during part of February.

Rating table for St. Joseph River at Fort Wayne, Ind., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.80	80	3.10	635	4.40	1,515	6.20	3,190
1.90	105	3.20	695	4.50	1,590	6.40	3,420
2.00	135	3.30	755	4.60	1,670	6.60	3,660
2.10	165	3.40	815	4.70	1,750	6.80	3,900
2.20	200	3.50	880	4.80	1,830	7.00	4,150
2.30	240	3.60	945	4.90	1,910	7.20	4,410
2.40	280	3.70	1,010	5.00	2,000	7.40	4,670
2.50	325	3.80	1,080	5.20	2,180	7.60	4,940
2.60	370	3.90	1,150	5.40	2,365	7.80	5,220
2.70	420	4.00	1,220	5.60	2,560	8.00	5,500
2.80	470	4.10	1,290	5.80	2,760	9.00	7,000
2.90	525	4.20	1,365	6.00	2,970	10.00	8,600
3.00	580	4.30	1,440				

TE.—The above table is applicable only for open-channel condition. It is based on discharge urements made during 1905–6, and is well defined between gage heights 2 feet and 6 feet.

Monthly discharge of St. Joseph River at Fort Wayne, Ind., for 1906.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
ary	5,500	240	1,430
uary [a]	1,010	.....	330
ch	7,240	220	1,570
l	5,580	348	1,420
	445	135	243
	1,630	120	490
(1-20)	280	68	156

[a] Discharge corrected for effect of ice conditions.

TE.—Values are rated as follows: February, fair; remainder of period, excellent.

ST. MARYS RIVER AT FORT WAYNE, IND.

This station was established March 20, 1905, and was discontinued y 21, 1906. It was located on the Taylor Street Bridge, in Fort yne, about 2.5 miles above the junction of the stream with the Joseph. The conditions at this station and the bench marks described in Water-Supply Paper No. 170, page 55.

Discharge measurements of St. Marys River at Fort Wayne, Ind., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
h 20	Hanna and Clapp	120	600	5.59	1,360
26	M. S. Brennan	104	199	2.17	208
13	S. K. Clapp	105	254	2.51	246
ust 22	M. S. Brennan	104	173	1.87	122
ber 4	do	105	182	1.92	133
mber 7	do	113	516	5.00	451
1906.					
h 9	E. F. Kriegsman	104	226	2.60	306
l 4	do	138	745	6.42	1,870
l 5	do	120	609	5.60	1,610
11	do	65	56	1.40	58
11	do	85	117	1.40	55
29	do	46	22	1.07	31

Daily gage height, in feet, of St. Marys River at Fort Wayne, Ind., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	Ju
1	3.25	2.38	2.20	11.25	1.54	1.26	
2	3.50	2.53	2.25	9.95	1.50	1.28	
3	3.85	2.15	2.68	8.12	1.48	1.29	
4	4.10	2.05	2.67	6.42	1.45	1.30	
5	4.35	1.95	2.60	5.40	1.43	1.40	
6	4.05	1.94	2.57	5.08	1.40	1.45	
7	3.85	1.93	2.51	4.45	1.37	1.50	
8	3.40	1.90	2.45	4.49	1.35	1.80	
9	3.05	1.87	2.55	7.98	1.33	1.89	
10	3.00	1.85	2.53	6.05	1.32	1.90	
11	2.95	1.82	2.51	4.77	1.32	1.80	
12	2.80	1.80	2.48	3.96	1.32	1.72	
13	2.79	1.74	2.45	3.50	1.29	1.65	
14	.....	1.70	2.43	6.38	1.25	1.56	
15	.....	1.68	2.35	6.28	1.22	1.40	
16	.....	1.65	2.15	4.95	1.20	1.35	
17	2.85	1.63	2.15	4.06	1.18	1.40	
18	.....	1.60	2.45	3.55	1.17	1.45	
19	.....	1.57	2.30	3.11	1.16	1.45	
20	.....	1.68	2.20	2.80	1.15	1.40	
21	5.37	1.75	2.10	2.52	1.15	1.35	
22	7.00	1.80	2.05	2.27	1.14	1.33	.....
23	6.15	1.89	2.00	2.14	1.13	1.30	.....
24	5.40	2.02	1.82	2.01	1.12	1.24	.....
25	4.33	2.86	1.85	1.90	1.12	1.18	.....
26	3.51	2.83	2.05	1.85	1.11	1.15	.....
27	3.10	2.90	10.42	1.83	1.10	1.12	.....
28	2.70	3.22	10.92	1.80	1.10	1.10	.....
29	2.51	.....	10.20	1.72	1.09	1.06	.....
30	2.42	.....	10.20	1.57	1.09	1.02	.....
31	2.33	.....	11.60	.....	1.22	.....	.....

NOTE.—The river was frozen January 14 to 20, the ice reaching a thickness of 4 inches. The river w clear of ice on January 21, and was probably not obstructed after that date, except on February 25 a March 18 to 20, on which dates there was backwater caused by an ice gorge below.

Rating table for St. Marys River at Fort Wayne, Ind., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	23	2.30	210	3.60	586	5.80	1,530
1.10	30	2.40	234	3.70	620	6.00	1,630
1.20	38	2.50	260	3.80	655	6.20	1,730
1.30	47	2.60	286	3.90	690	6.40	1,850
1.40	57	2.70	314	4.00	725	6.60	1,970
1.50	69	2.80	342	4.20	800	6.80	2,090
1.60	82	2.90	370	4.40	880	7.00	2,210
1.70	96	3.00	400	4.60	960	8.00	2,810
1.80	111	3.10	430	4.80	1,040	9.00	3,510
1.90	127	3.20	460	5.00	1,130	10.00	4,210
2.00	145	3.30	490	5.20	1,230	11.00	5,010
2.10	165	3.40	522	5.40	1,330	12.00	5,810
2.20	187	3.50	554	5.60	1,430		

NOTE.—The above table is applicable only for open-channel conditions. It is based on twelve di charge measurements made during 1905–6. It is well defined between gage heights 1.0 foot and 2.7 feet and is fairly well defined above 2.7 feet.

Monthly discharge of St. Marys River at Fort Wayne, Ind., for 1905-6.

[Drainage area, 740 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
31 [a]	234	117	174	0.235	0.05
	2,660	69	309	.418	.47
	325	27	90.9	.123	.14
	300	26	98.1	.133	.15
er	880	26	270	.365	.41
	165	50	81.9	.111	.13
er	992	47	145	.196	.22
r [b]	760	90	386	.522	.60
1906.					
[c]	2,210		586	.792	.91
y [c]	370	78	157	.212	.22
	5,490	114	945	1.28	1.48
	5,210	78	1,120	1.51	1.68
	74	29	43.6	.059	.07
	127	24	61.1	.083	.09
l	370	24	97.7	.132	.10

ıg to errors in chain length, no reliable estimates of discharge can be made prior to May 26,

:water caused by ice gorge below gage December 4 to 8 and 13 to 16, 1905; discharge estimated.
ng ice periods discharge estimated.
—Values for 1905 and 1906 are good.

TIFFIN RIVER NEAR DEFIANCE, OHIO.

is station was established May 19, 1903, and was discontinued ı 31, 1906. It was located at the highway bridge on the new road ansport, one-half mile above the settlement of Brunnesburg and 3 by river above the center of the city of Defiance. The condi- at this station and the bench marks are described in Water- ly Paper No. 170, page 56, where are given also references to cations that contain data for previous years.

neasurement was made March 8, 1906, by E. F. Kriegsman, with ollowing results:

th, 107 feet; area, 434 square feet; gage height, 4.69 feet; discharge, 507 second-

Daily gage height, in feet, of Tiffin River near Defiance, Ohio, for 1906.

›ay.	Feb.	Mar.	Day.	Feb.	Mar.	Day.	Feb.	Mar.
		4.4	12		4.4	23		3.3
		3.9	13		4.2	24		3.4
		4.65	14		3.9	25		[a] 3.4
		[a] 4.9	15		3.8	26	4.4	3.4
		5.1	16		3.7	27	4.5	8.2
		5.7	17		3.6	28	4.7	10.6
		5.2	18		[a] 3.4	29		10.4
		4.8	19		3.2	30		9.7
		4.6	20		3.1	31		9.1
		4.75	21		3.6			
		[a] 4.6	22		3.4			

[a] Gage heights interpolated.

Rating table for Tiffin River near Defiance, Ohio, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.10	159	3.80	309	4.50	499	7.00	1,320
3.20	178	3.90	334	4.60	528	8.00	1,690
3.30	198	4.00	360	4.70	558	9.00	2,090
3.40	219	4.10	387	4.80	588	10.00	2,500
3.50	240	4.20	414	4.90	619	11.00	2,930
3.60	262	4.30	442	5.00	650		
3.70	285	4.40	470	6.00	970		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906, and is well defined below gage height 5.7 feet.

Monthly discharge of Tiffin River near Defiance, Ohio, for 1906.

[Drainage area, 748 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
February (26–28)	558	470	509	0.680	0.08
March	2,760	159	714	.955	1.10

NOTE.—Values for 1906 are excellent.

BLACK RIVER BASIN.

BLACK RIVER NEAR ELYRIA, OHIO.

This station was established May 23, 1903, the object being to furnish data for the water supply of nearby towns, and was discontinued July 21, 1906. It was located at the North Ridge Road Bridge, about 5 miles from the center of the city of Elyria. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 59, where are given also references to publications that contain data for previous years.

Discharge measurements of Black River near Elyria, Ohio, in 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 9	R. W. Pratt	79	188	3.55	291
May 17	do	63	66	1.70	68
June 22	do	35	20	1.15	12
Do	do	35	19	1.15	11.4
July 6	do	80	246	4.11	894
July 28	do	41	24	1.28	25
August 11	do	34	14	1.05	8.2
October 4	do	35	17	1.14	10.5
November 4	do	33	13	0.96	2.8
1905.					
January 17 [a]	R. W. Pratt	75	119	2.80	134
February 1 [a]	do	39	41	1.75	24
May 24	M. S. Brennan	69	52	1.44	56
October 20	R. W. Pratt	35	.....	1.08	10.5
November 4	do	55	30	1.15	12
1906.					
March 7	E. F. Kriegsman	68	66	1.62	103
May 14	do	66	42	1.33	18

[a] *River frozen over; measurements indicate that flow is about 25 per cent of the open-channel discharge for the same gage heights.*

Daily gage height, in feet, of Black River near Elyria, Ohio, for 1905-6.

1905.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.4	1.1	6.0	1.7	1.8	1.45	1.1	0.9	1.1	1.0	1.2	4.3
.....	2.35	1.1	4.0	1.5	1.8	1.4	1.0	.9	1.1	1.1	1.2	4.0
.....	2.3	1.2	4.0	1.4	1.6	1.4	1.0	.9	1.0	1.1	1.1	3.7
.....	2.15	1.2	4.0	1.4	1.5	1.35	1.1	1.0	1.0	1.0	1.1	3.4
.....	2.1	1.1	4.0	1.3	1.5	1.2	1.4	1.4	1.0	1.0	1.1	3.1
.....	2.4	1.1	4.0	1.3	1.4	2.5	1.4	1.5	1.05	1.1	1.1	2.8
.....	2.4	1.0	4.1	1.2	1.5	2.5	1.3	1.4	1.05	1.1	1.9	2.4
.....	2.2	1.0	5.0	1.2	1.4	3.5	1.35	.9	1.0	1.1	2.2	2.4
.....	2.1	1.1	6.0	1.2	1.3	3.5	1.3	.9	1.0	1.05	2.1	2.3
.....	1.7	1.1	5.0	1.4	1.4	3.0	1.4	1.1	1.05	.9	2.0	2.2
.....	2.1	1.05	5.1	1.5	1.9	2.0	1.35	1.1	1.1	1.1	1.8	2.2
.....	2.2	1.05	5.0	5.0	11.1	3.0	1.3	1.1	1.2	1.1	1.6	2.1
.....	2.0	.9	5.0	4.0	8.0	2.1	1.2	1.0	1.4	1.2	1.5	2.1
.....	1.9	.9	4.1	3.5	4.1	2.05	1.2	1.5	1.4	1.2	1.5	2.1
.....	1.7	.9	4.0	2.2	3.0	1.1	1.1	2.5	1.3	1.1	1.4	2.0
.....	2.1	.9	2.1	2.5	3.5	2.0	1.1	2.5	1.2	1.1	1.4	1.9
.....	2.8	.9	2.1	2.5	3.5	3.5	1.1	2.5	1.1	1.2	1.3	1.7
.....	3.3	1.0	3.0	3.0	3.5	3.0	1.0	2.0	2.5	1.2	1.3	1.6
.....	2.1	1.0	5.1	2.1	3.0	2.5	1.0	2.0	2.0	1.3	1.2	1.5
.....	2.0	1.05	6.0	2.1	2.1	2.0	1.05	2.0	1.8	1.2	1.2	1.3
.....	1.7	1.3	5.0	6.1	2.0	2.0	1.0	2.0	2.0	1.5	1.2	1.3
.....	1.6	1.35	4.1	6.0	2.0	1.7	1.15	1.8	1.8	1.9	1.1	3.3
.....	1.5	3.0	3.0	4.1	1.9	1.5	1.1	2.5	1.7	1.8	1.1	3.0
.....	1.5	3.0	3.0	3.0	1.5	1.4	1.1	2.0	1.5	1.7	1.0	2.6
.....	1.6	4.0	2.5	2.1	1.4	1.3	1.05	2.0	1.5	1.5	1.0	2.4
.....	1.55	4.0	2.5	2.0	1.6	1.2	1.0	1.8	1.4	1.5	1.0	2.0
.....	1.5	6.0	2.5	3.1	3.0	1.1	1.0	1.5	1.3	1.4	1.1	1.6
.....	1.4	7.0	2.5	2.1	2.8	1.1	1.1	1.4	1.2	1.2	1.4	1.5
.....	1.2	.....	2.0	2.0	2.7	1.05	1.1	1.4	1.1	1.1	1.9	1.8
.....	1.2	.....	1.8	1.8	2.6	1.0	1.0	1.3	1.0	1.1	4.5	2.1
.....	1.1	.....	1.7	.....	2.5	.....	1.0	1.2	.....	1.2	.....	2.0

1906.

.....	2.1	1.6	2.5	7.5	1.3	2.0	0.9	.....	.....	.....	.....	.....
.....	2.2	1.5	2.1	7.1	1.25	1.7	.9	.....	.....	.....	.....	.....
.....	2.3	1.4	1.8	5.2	1.2	1.4	.95	.....	.....	.....	.....	.....
.....	2.3	1.6	1.7	4.0	1.2	1.35	1.1	.....	.....	.....	.....	.....
.....	2.2	1.6	1.7	3.9	1.3	1.3	1.15	.....	.....	.....	.....	.....
.....	2.1	1.5	1.6	3.5	1.25	1.2	1.1	.....	.....	.....	.....	.....
.....	2.0	1.4	1.6	3.1	1.2	1.3	1.05	.....	.....	.....	.....	.....
.....	2.0	1.4	1.7	3.0	1.2	1.1	1.0	.....	.....	.....	.....	.....
.....	2.2	1.4	1.8	2.8	1.4	1.1	1.0	.....	.....	.....	.....	.....
.....	2.2	1.5	1.8	2.9	1.5	1.15	.95	.....	.....	.....	.....	.....
.....	1.9	1.8	1.9	2.8	1.45	1.1	.95	.....	.....	.....	.....	.....
.....	1.8	1.9	2.1	2.7	1.3	1.05	.9	.....	.....	.....	.....	.....
.....	1.9	1.9	2.2	2.5	1.25	1.0	.9	.....	.....	.....	.....	.....
.....	2.5	2.0	2.2	2.1	1.4	1.0	1.2	.....	.....	.....	.....	.....
.....	3.8	2.5	2.3	1.8	1.3	1.0	1.8	.....	.....	.....	.....	.....
.....	3.9	2.9	2.2	1.9	1.3	.95	1.9	.....	.....	.....	.....	.....
.....	4.1	3.4	1.9	2.1	1.3	.95	1.6	.....	.....	.....	.....	.....
.....	3.4	3.5	1.7	1.8	1.25	.9	1.4	.....	.....	.....	.....	.....
.....	3.2	3.4	2.1	1.7	1.2	1.0	1.2	.....	.....	.....	.....	.....
.....	3.1	3.5	2.2	1.5	1.2	1.0	1.2	.....	.....	.....	.....	.....
.....	3.0	4.1	2.3	1.4	1.3	.95	1.1	.....	.....	.....	.....	.....
.....	2.8	4.3	2.0	1.3	1.25	1.05	.....	.....	.....	.....	.....	.....
.....	2.5	3.9	1.8	1.3	1.2	1.0	.....	.....	.....	.....	.....	.....
.....	2.4	3.5	1.7	1.2	1.2	1.0	.....	.....	.....	.....	.....	.....
.....	2.4	3.3	1.7	1.3	1.15	.9	.....	.....	.....	.....	.....	.....
.....	2.3	3.2	1.8	1.4	1.15	.9	.....	.....	.....	.....	.....	.....
.....	2.1	3.1	12.2	1.4	1.25	.95	.....	.....	.....	.....	.....	.....
.....	2.0	2.8	12.4	1.3	1.2	.95	.....	.....	.....	.....	.....	.....
.....	1.9	.....	7.7	1.2	1.2	.9	.....	.....	.....	.....	.....	.....
.....	1.7	.....	7.9	1.2	2.15	.9	.....	.....	.....	.....	.....	.....
.....	1.6	.....	8.2	.....	2.05	.....	.....	.....	.....	.....	.....	.....

—The above gage heights for 1905-6 were recorded erroneously in some cases, but have been as far as possible. They are still liable to some error. Ice conditions January 1 to February River *frozen February 1 to 18, 1906*; thickness of ice, 0.2 to 0.8 foot.

Rating table for Black River near Elyria, Ohio, for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.90	2	2.30	294	3.70	748	6.00	1,550
1.00	5	2.40	324	3.80	782	7.00	1,900
1.10	10	2.50	355	3.90	816	8.00	2,250
1.20	18	2.60	386	4.00	850	9.00	2,600
1.30	31	2.70	417	4.20	920	10.00	2,950
1.40	48	2.80	448	4.40	990	11.00	3,300
1.50	70	2.90	479	4.60	1,060	12.00	3,650
1.60	94	3.00	510	4.80	1,130	13.00	4,000
1.70	120	3.10	544	5.00	1,200	14.00	4,350
1.80	148	3.20	578	5.20	1,270	15.00	4,700
1.90	177	3.30	612	5.40	1,340	16.00	5,050
2.00	205	3.40	646	5.60	1,410	17.00	5,400
2.10	235	3.50	680	5.80	1,480	18.00	5,750
2.20	264	3.60	714				

NOTE.—The above table is applicable only for open-channel conditions. It is based on disch measurements made during 1904–1906, and is not well defined.

Monthly discharge of Black River near Elyria, Ohio, for 1904–1906.

[Drainage area, 417 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
1904.					
January	5,920	31	808	1.94	
February	3,720	235	869	2.09	
March	4,210	70	1,210	2.90	
April	4,140	18	676	1.62	
May	1,480	5	227	.544	
June	2,500	5	300	.719	
July	2,500	5	255	.612	
August	177	2	68.8	.165	
September	31	2	11.0	.026	
October	31	2	[a] 12.1	.029	
November	177	2	75.1	.180	
December (1-18)	94	5	48.0	.115	
1905.					
March	1,550	120	799	1.92	
April	1,580	18	371	.890	
May	3,340	31	440	1.06	
June	680	5	215	.516	
July	48	5	16.5	.040	
August	355	2	112	.269	
September	355	5	56.2	.135	
October	177	2	32.1	.077	
November	1,020	5	94.7	.227	
December	955	31	319	.765	
1906.					
January	885	94	346	.830	
February 19-28	955	448	684	1.64	
March	3,790	94	616	1.48	
April	2,080	18	410	.983	
May	250	14	40.8	.098	
June	206	2	20.6	.049	
July 1-21	177	2	28.7	.069	

[a] Gage heights published as 1.01, 1.02, and 1.03 in Water-Supply Paper No. 129 should be 1.1, 1.2, and

NOTE.—The above values are rated as fair with the exception of January to March, 1904. No concerning ice conditions during these months were available and hence the open-channel rating applied for this period. The procedure may involve large errors.

CUYAHOGA RIVER BASIN.

DESCRIPTION OF BASIN.

Cuyahoga River rises in eastern Geauga County, flows south-southwestward to a point within about 2 miles of Akron, then turns sharply and flows northwestward to Lake Erie. Its course is extremely tortuous. In one place a straight line 5 miles long would connect two points 12 miles apart by the channel. The valley consists largely of a series of basins, the hills reaching 200 feet or more in height. Many lakes and swamps occur in the headwater region.

CUYAHOGA RIVER AT INDEPENDENCE, OHIO.

This station was established September 21, 1903, and was discontinued July 21, 1906. It was located at the highway bridge at the town of Independence, 10 miles south of Cleveland and 4 miles south of the gaging station formerly located on the highway bridge between Brooklyn and Newberg, Ohio. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 60, where are given also references to publications that contain data for previous years.

Discharge measurements of Cuyahoga River at Independence, Ohio, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 7	E. F. Kriegsman	78	335	6.26	803
May 14	do	62	264	5.39	419

Daily gage height, in feet, of Cuyahoga River at Independence, Ohio, for 1906.

Day.	Jan.	Feb.[a]	Mar.	Apr.	May.	June.	July.
1	5.75	5.25	5.4	9.1	5.1	4.8	4.5
2	5.4	4.75	5.25	8.8	5.05	5.5	4.5
3	5.35	4.9	5.45	7.75	5.0	5.0	4.55
4	7.2	5.0	5.9	6.65	5.05	4.9	5.0
5	6.85	5.25	6.4	6.4	5.65	4.8	4.85
6	6.55	5.25	6.2	7.0	5.9	4.95	5.0
7	6.4	5.5	6.25	6.7	6.4	5.05	5.2
8	6.25	5.5	6.2	6.0	6.05	5.1	5.1
9	5.75	5.5	6.05	6.35	5.8	5.0	4.85
10	5.45	5.5	6.3	7.5	6.0	4.95	5.0
11	5.6	5.48	6.5	7.1	6.75	4.65	4.8
12	5.4	5.45	6.4	7.0	5.6	4.8	4.7
13	5.4	5.45	5.5	7.0	5.6	4.65	4.7
14	5.35	5.4	5.4	6.85	5.55	4.6	4.5
15	5.3	5.4	5.3	6.6	5.3	4.7	4.5
16	6.25	5.4	5.25	6.35	5.2	4.6	4.5
17	5.95	5.4	5.2	6.15	5.2	4.55	5.05
18	6.0	5.4	5.2	5.8	5.2	4.45	4.85
19	6.95	5.4	5.2	5.65	5.05	5.0	4.75
20	6.7	5.4	5.2	5.4	5.0	5.0	4.7

[a] Ice conditions during month.

NOTE.—The rating table published for 1905 will give approximate results if applied to the
heights.

LAKE ONTARIO DRAINAGE.

GENERAL FEATURES.

In the northwestern part of the State of New York, between
and St. Lawrence rivers, is an area aggregating 12,400 squa
drained by streams which flow into Lake Ontario. The divid
controls this drainage is very irregular. Extending to the so
southeast from Fort Niagara, it passes around the headwater
Genesee a short distance into Pennsylvania; thence reenteri
York it runs southward and eastward from the interior group
turns to the north, encircles the sources of Black River, turns
the west, and descends to the lake. The country thus included
or gently undulating in the counties bordering the lake, but
south it becomes more rolling, and a series of ridges, gradually
ing in height, stretch down between Cayuga and Seneca a
companion lakes, finally becoming merged with the elevated,
country forming the principal divide, the abrupt slopes o
attain altitudes of from 2,000 to 2,500 feet about the headw
the Genesee.

The easterly or Black River lobe of the drainage basin rece
run-off from the southwestern slope of the Adirondack Mou
largely a rugged and forest-covered area receiving heavy precip

ake Ontario 7 miles north of Rochester. The entire length of the tream, following bends, is about 135 miles, and the drainage area is 2,496 square miles.

In the 39 miles between Belmont, in central Allegany County, and Portage, in southwestern Livingston County, the fall of the water surface is 253 feet, an average of 6.4 feet per mile. At Portage the river plunges down in three magnificent falls, and thence nearly to Mount Morris flows at the bottom of a deep gorge. From Mount Morris to Rochester the valley is broad and open and the stream is bordered by meadows subject to occasional overflow. At Rochester there is another abrupt descent over three heavy falls, amounting to about 260 feet within the city.

The series of remarkable lakes tributary to the Oswego basin is continued westward into the basin of the Genesee and includes Conesus, Hemlock, Canadice, and Honeoye lakes. These lakes serve as natural reservoirs and have inlets draining considerable areas at their upper ends. The slopes adjacent to the lakes themselves are narrow and steep and are drained by gulleys and torrential brooks. The area below the lakes is rolling and the soil is rich and extensively cultivated. The areas and elevations of these lakes are shown in the following table:

Areas and elevations of lakes in Genesee River basin.[a]

Lake.	Elevation.	Water-surface area.	Drainage area.	Per cent water surface.
	Feet.	*Sq. miles.*	*Sq. miles.*	
Hemlock Lake	896	2.8	46.8	6.12
Canadice Lake	1,092	.7	12.6	5.57
Honeoye Lake	899	2.5	39.6	6.41

[a] These lake basins are shown on the Honeoye, Canandaigua, Naples, and Wayland topographic atlas sheets of the United States Geological Survey, from which the areas have been taken, with the exception of those for Hemlock and Canadice lakes, which are from surveys for the Rochester waterworks.

Above all the private dams at Rochester the State has a dam for diverting water to the Erie Canal, and in the basin of Black Creek, one of the upper tributaries of the Genesee from the west, are two reservoirs, owned by the State, also used for the benefit of the Erie Canal.

Cuba reservoir, on the Genesee-Allegheny divide, receives the drainage from a tributary area of 26.6 square miles. The storage volume is 454,000,000 cubic feet. The overflow from this reservoir enters Allegheny River. The storage water may be turned into the summit level of the abandoned Genesee Valley Canal and thence into Genesee River.

GENESEE RIVER AND CANASERAGA CREEK NEAR MOUNT MOR N. Y.

This station was established May 22, 1903, and was discontin April 30, 1906. It was located at the highway bridge near Mo Morris, a short distance below the inflow of Canaseraga Creek. T conditions at this station and the bench marks are described in Wat Supply Paper No. 170, page 65, where are given also references publications that contain data for previous years.

Discharge measurements of Genesee River near Mount Morris, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dischr
		Feet.	*Sq. ft.*	*Feet.*	*Sec.*
February 12 [a]	C. C. Covert	118	298	5.75	
February 13 [a]	do	118	290	5.78	
February 16 [a]	do	127	373	6.00	
March 29	do	171	1,640	13.90	
March 30	do	166	1,500	13.10	
March 31	do	193	2,660	19.05	1
March 31	do	193	2,630	18.85	1
April 1	do	185	1,750	14.33	
April 2	do	163	1,210	11.60	
April 3	do	161	1,050	10.50	
April 4	do	161	1,120	10.85	
April 14	do	153	864	9.38	
April 21	do	120	502	6.89	1
April 22	do	127	460	6.60	1
April 23	do	127	504	6.90	1
September 15	do	70	191	4.15	

[a] Measurements made under ice cover, average thickness of ice, 0.49 foot, 0.41 foot, and 0.68 foot, re tively. Gage height to bottom of ice, 5.36 feet, 5.47 feet, and 5.42 feet, respectively.

Daily gage height, in feet, of Genesee River near Mount Morris, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	A
1	8.2	6.4	6.65	13.85	17	8.95	5.75	4.95	
2	7.3	5.8	6.85	11.2	18	7.95	5.8	4.8	
3	6.8	7.7	6.3	10.3	19	7.2	5.6	4.8	
4	7.2	7.5	8.25	10.5	20	6.55	5.5	5.9	
5	9.7	7.35	8.0	13.4	21	12.05	5.6	5.15	
6	7.7	7.1	6.1	12.35	22	16.25	6.5	5.0	
7	6.3	6.65	5.9	11.45	23	15.45	6.55	5.0	
8	6.1	6.5	5.7	9.95	24	15.3	6.1	4.7	
9	7.2	6.4	5.5	9.55	25	10.5	5.85	4.85	
10	9.0	6.3	5.5	13.2	26	8.35	6.05	5.05	
11	8.8	6.05	5.25	14.1	27	7.45	5.65	9.1	
12	8.9	5.75	5.25	11.7	28	7.0	7.05	21.43	
13	8.3	5.55	5.25	10.35	29	6.7	.....	14.7	
14	7.7	5.95	5.05	9.35	30	6.3	.....	13.5	
15	7.55	6.0	5.0	10.55	31	6.15	.....	18.45	....
16	7.05	5.8	5.1	11.1					

NOTE.—River frozen over from February 1 to March 20, approximately. During frozen period readings were taken to water surface through a hole cut in ice. Ice averaged from 0.2 to 0.6 foot thic gage and from 0.3 to 0.8 foot thick 200 feet below.

This station has backwater conditions during the spring floods; also considerable water flows arm the left-hand end of the bridge above gage height 18.0 feet.

Rating table for Genesee River near Mount Morris, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.70	490	6.10	1,215	7.50	2,030	9.80	3,560
4.80	535	6.20	1,270	7.60	2,090	10.00	3,700
4.90	580	6.30	1,325	7.70	2,155	10.20	3,840
5.00	625	6.40	1,380	7.80	2,220	10.40	3,980
5.10	675	6.50	1,435	7.90	2,285	10.60	4,120
5.20	725	6.60	1,490	8.00	2,350	10.80	4,270
5.30	775	6.70	1,550	8.20	2,480	11.00	4,420
5.40	830	6.80	1,610	8.40	2,610	12.00	5,170
5.50	885	6.90	1,670	8.60	2,740	13.00	5,960
5.60	940	7.00	1,730	8.80	2,870	14.00	6,760
5.70	995	7.10	1,790	9.00	3,000	15.00	7,560
5.80	1,050	7.20	1,850	9.20	3,140	16.00	8,360
5.90	1,105	7.30	1,910	9.40	3,280	17.00	9,160
6.00	1,160	7.40	1,970	9.60	3,420	18.00	9,960

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1906 and is fairly well defined.

Monthly discharge of Genesee River near Mount Morris, N. Y., for 1906.

[Drainage area, 1,070 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	8,560	1,220	2,830	2.64	3.04
February	1,080	442	650	.607	.63
March	11,000	268	1,690	1.58	1.82
April	6,840	885	3,290	3.07	3.42

NOTE.—Discharges February 1 to March 20 have been taken as 50 per cent of the open-water flow; backwater assumed March 28, discharge corrected.
Values are rated as follows: January and April, good; March, fair; February, approximate.

Discharge measurements of Canaseraga Creek near Mount Morris, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 29	C. C. Covert	84	500	9.22	1,880
March 30	do	84	456	8.90	1,620
March 31 [a]	do	94	900	13.55	1,670
April 2	do	81	368	7.85	1,430
April 3	do	75	310	7.00	1,150
April 21	do	66	142	4.45	478

[a] Backwater from Genesee River.

GENESEE RIVER AT HIGH DAM NEAR MOUNT MORRIS, N. Y.

A gaging station has been established at the dam of the Mount Morris Water Power Company, in the village of Mount Morris, N. Y., and readings have been taken regularly twice each day, by John McAstocker, since September 1, 1905.

The dam is of masonry construction, having a horizontal crest of open cross section 255 feet long. There are two waste ways, having crests each 12 inches wide and 18.0 feet and 17.9 feet long, respectively, closed by stop planks to about 2 feet above the main crest; also one short spillway with crest 6 inches wide and 17 feet long and about 1 foot higher than the wasteways. The dam and the spillways

are separated by masonry piers 6 feet, 8 feet, and 6 feet in wid respectively.

A portion of the flow is diverted through a section of the old Gene Valley Canal, which is utilized as a headrace, the power being usec drive a number of mills and factories. In order to determine amount of this diversion, a gage has been placed in the tailrace be the mills. It is read twice each day by F. M. Goff, electrical engir in the employ of the power company. A number of meter meas ments have been made, and a rating curve to determine the d flow through the canal is partly developed. When the comp curve is developed, the data will be published.

GENESEE RIVER AT ROCHESTER, N. Y.

This station was established February 9, 1904. It is located at Elmwood Avenue Bridge, in Rochester, N. Y. The conditions at station[a] and the bench marks are described in Water-Supply Pa No. 170, page 69, where are given also references to publications t contain data for previous years.

Discharge measurements of Genesee River at Rochester, N. Y., in 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Disch
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
1904.					
July 20	C. C. Covert		1,010	1.30	
August 9	E. H. Fisher		976	1.18	
August 10	do		957	1.10	
August 11	do		944	1.15	
August 12	do		963	1.20	
August 15	do		973	1.10	
August 27	do		972	1.22	
August 30	do		916	1.07	
September 17	do		923	1.05	
November 11	C. C. Covert		994	1.20	
1905.					
March 22	Covert and Weeks	382	4,220	10.00	
March 22	do	382	4,200	9.95	
March 25	do	382	4,300	10.20	
March 27	do	382	4,200	9.92	
March 27	do	382	4,160	9.82	
March 28	do	382	4,050	9.50	
March 29	do	382	3,960	9.08	
April 2	do	373	2,140	4.18	
April 3	do	372	1,890	3.50	
April 4	do	372	1,820	3.28	
May 28	C. C. Covert	352	974	1.11	
1906.					
February 14[b]	Covert and Weeks	306	1,710	1.40	
February 15[c]	do	360	1,020	1.53	
March 28	Weeks and Casey	383	3,160	6.85	
March 29	do	383	3,320	7.32	
March 30	do	383	2,680	5.64	
March 31	do	383	2,860	6.06	
March 31	do	383	2,940	6.31	
April 1	do	384	3,040	6.60	
April 1	do	383	3,050	6.36	
April 2	do	376	2,480	5.08	
April 2	do	375	2,330	4.70	
April 3	do	374	2,100	4.10	

[a] The gage datum is 245.59 feet above the city topographic datum, to which gage heights publish 1904 refer.

[b] Measured under ice cover, about one-fourth mile above regular section; gage height to top of ic feet; average thickness of ice, 0.50 foot.

[c] Measured under ice cover at regular section; gage height to top of ice, 1.63 feet; average thickn ice, 0.46 foot; some needle ice.

Daily gage height, in feet, of Genesee River at Rochester, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	3.0	2.0	1.7	6.5	1.8	2.4	1.5	1.1	1.3	1.2	3.0	2.06
.....	2.9	2.0	2.0	5.6	1.9	2.0	1.4	1.2	1.2	1.3	3.0	2.05
.....	2.9	2.0	1.5	4.2	2.2	1.9	1.4	1.3	1.1	1.6	3.0	2.04
.....	2.5	2.0	1.9	3.8	3.5	1.8	2.2	1.2	1.1	1.4	2.9	2.03
.....	2.3	2.0	2.7	4.0	3.0	1.7	2.6	1.6	1.1	1.4	2.8	2.02
.....	3.3	1.9	3.1	4.9	3.1	1.5	2.0	1.7	1.1	1.5	2.6	2.01
.....	2.9	1.9	2.1	4.6	2.9	2.7	1.8	1.6	1.0	2.5	2.4	6.02
.....	2.4	1.8	2.0	4.0	2.5	2.5	1.6	1.6	1.0	3.5	2.3	6.08
.....	2.4	1.8	1.9	3.6	2.2	2.7	1.4	1.7	1.0	2.8	2.1	5.0
.....	2.3	1.8	1.8	5.0	2.1	1.9	1.4	1.7	1.0	2.4	2.0	3.06
.....	2.1	1.7	1.6	5.9	2.4	1.8	1.4	1.5	1.0	2.5	2.0	3.01
.....	1.9	1.7	1.3	5.5	2.3	1.8	1.3	1.6	1.0	2.8	2.3	4.04
.....	2.2	1.4	1.6	4.5	2.1	1.8	1.3	1.8	1.0	2.6	2.06	3.03
.....	1.9	1.4	1.5	3.8	2.0	1.7	1.2	1.6	1.0	2.2	3.01	3.0
.....	1.7	1.5	1.6	3.5	2.2	1.5	1.1	1.5	1.0	2.1	2.09	3.02
.....	1.9	2.0	1.5	4.0	2.2	1.5	1.1	1.5	1.0	2.0	2.08	6.0
.....	2.2	2.0	1.4	3.8	2.1	1.5	1.1	1.4	1.0	1.9	2.06	5.06
.....	2.3	1.8	1.4	3.3	2.1	1.8	1.2	1.3	1.0	1.8	2.08	4.0
.....	2.2	1.6	1.4	3.0	2.5	1.9	1.4	1.2	1.0	1.7	4.07	3.05
.....	2.1	1.4	1.3	2.8	2.3	1.9	1.3	1.1	1.0	1.9	5.0	3.0
.....	2.7	1.5	1.5	2.5	2.0	1.7	1.2	1.1	1.0	3.4	4.04	2.06
.....	4.9	1.8	1.6	2.3	1.8	1.6	1.2	1.4	1.0	3.1	6.04	2.01
.....	5.6	2.0	1.4	2.2	1.7	1.5	1.2	1.4	1.3	2.6	5.08	2.1
.....	5.3	2.0	1.6	2.3	1.6	1.5	1.2	1.8	1.3	2.5	4.06	2.0
.....	4.9	2.1	1.6	2.2	1.9	1.5	1.1	2.0	1.4	2.3	3.07	3.0
.....	3.5	2.1	1.5	2.1	2.2	1.5	1.0	1.8	1.3	3.6	3.04	3.2
.....	2.7	1.8	2.4	2.0	1.9	1.5	1.0	1.5	1.3	3.3	3.02	3.0
.....	2.4	1.6	6.0	1.9	1.9	1.4	1.0	1.4	1.1	2.6	3.00	2.8
.....	2.1	.....	7.3	1.8	3.2	1.3	1.1	1.4	1.1	2.4	3.01	2.7
.....	2.4	.....	5.8	1.8	2.6	1.5	1.2	1.5	1.1	2.5	2.08	2.3
.....	2.1	.....	6.0	.....	2.2	.....	1.2	1.3	.....	2.5	.....	2.3

Rating table for Genesee River at Rochester, N. Y., for 1903, 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	400	2.30	2,140	3.60	4,840	5.80	10,800
1.10	490	2.40	2,320	3.70	5,080	6.00	11,400
1.20	580	2.50	2,500	3.80	5,320	6.20	12,000
1.30	670	2.60	2,700	3.90	5,560	6.40	12,600
1.40	760	2.70	2,900	4.00	5,800	6.60	13,220
1.50	850	2.80	3,100	4.20	6,320	6.80	13,840
1.60	1,000	2.90	3,300	4.40	6,840	7.00	14,500
1.70	1,150	3.00	3,500	4.60	7,380	8.00	17,800
1.80	1,300	3.10	3,720	4.80	7,940	9.00	21,400
1.90	1,450	3.20	3,940	5.00	8,500	10.00	25,100
2.00	1,600	3.30	4,160	5.20	9,060	11.00	29,000
2.10	1,780	3.40	4,380	5.40	9,620		
2.20	1,960	3.50	4,600	5.60	10,200		

E.—The above table is applicable only for open-channel conditions. It is based on discharge rements made during 1904-1906 and is well defined.

Monthly discharge of Genesee River at Rochester, N. Y., for 1904–1906.

[Drainage area, 2,360 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
1904. [a]					
February (9–12)	31,800	14,500	24,000	10.17	
March 2–31 [b]	27,000	2,500	12,900	5.47	
April [b]	13,200	4,160	7,460	3.16	
May	7,660	1,450	3,160	1.34	
June	8,500	670	2,230	.945	
July	3,100	670	1,310	.555	
August	1,150	400	634	.269	
September	850	400	523	.222	
October	2,500	490	986	.418	
November	760	490	562	.238	
December	13,200	490	1,570	.665	
1905. [c]					
January (1–27)	5,560	1,600	2,800	1.19	
March (18–31)	25,900	1,960	20,200	8.56	
April	13,200	2,320	4,150	1.76	
May	2,140	1,300	1,460	.619	
June	7,660	850	2,670	1.13	
July	4,380	715	1,340	.568	
August	3,720	535	1,230	.521	
September	850	400	580	.246	
October	1,000	400	589	.250	
November	7,940	580	1,400	.593	
December	7,380	580	2,690	1.14	
1906. [d]					
January	10,200	1,150	3,250	1.38	
February	1,780	760	1,320	.559	
March	15,500	670	2,680	1.14	
April	12,900	1,300	5,110	2.17	
May	4,600	1,000	2,130	.902	
June	2,900	670	1,300	.551	
July	2,700	400	783	.332	
August	1,600	490	878	.371	
September	760	400	484	.205	
October	4,840	580	2,280	.966	
November	11,600	1,600	3,650	1.55	
December	11,600	1,600	4,070	1.72	
The year	15,500	400	2,330	.987	

[a] Values for 1904 are rated as follows: February to May, good; June, July, October, and Dece fair; August, September, and November, approximate.
[b] Discharge interpolated for missing days.
[c] Values for 1905 are rated as follows: January, May to August, November, and December, fair; and April, good; September and October, approximate.
[d] Values for 1906 are rated as follows: January, April, November, and December, good; Feb March, May to August, and October, fair; September, approximate.

CANADICE LAKE OUTLET NEAR HEMLOCK, N. Y.

This station is located at a weir constructed at the outlet at foot of the lake by the city engineer's department of Rochester, N in February, 1903. The entire yield of the drainage basin passes weir. The conditions at this station and the bench marks described in Water-Supply Paper No. 170, page 71, where are g also references to publications that contain data for previous y

Monthly discharge of Canadice Lake outlet near Hemlock, N. Y., for 1906.

[Drainage area, 12.6 square miles.]

Month.	Mean discharge in second-feet.	Run-off.	
		Sec.-ft. per sq. mile.	Depth in inches.
y	9.52	0.755	0.87
ry	9.33	.740	.77
	11.1	.880	1.01
	27.7	2.20	2.45
	13.1	1.04	1.20
	10.9	.864	.95
	8.74	.693	.79
	8.14	.646	.75
ber	6.54	.519	.58
r	6.97	.552	.63
ber	27.1	2.15	2.40
er	33.0	2.62	3.02
he year	14.3	1.13	15.02

HONEOYE CREEK AT EAST RUSH, N. Y.

is station was established February 13, 1903, and was discon-d April 30, 1906. It was located at the gristmill dam in the e of East Rush. The conditions at this station and the bench s are described in Water-Supply Paper No. 170, page 72, where iven also references to publications that contain data for pre- years.

aily discharge, in second-feet, of Honeoye Creek at East Rush, N. Y., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
	84	84	60	527	17	60	70	60	305
	60	42	60	445	18	60	77	77	301
	52	42	148	329	19	84	70	44	305
	123	43	194	282	20	104	70	53	229
	141	42	172	553	21	169	172	74	231
	111	37	123	542	22	246	196	94	219
	77	33	84	505	23	321	104	70	214
	44	42	99	444	24	132	148	60	179
	44	40	70	541	25	84	169	25	149
	31	43	70	1,176	26	70	172	70	149
	29	25	77	764	27	70	84	1,107	125
	61	38	52	574	28	77	60	1,073	131
	88	39	52	497	29	60	.....	512	121
	43	70	52	411	30	70	.....	510	131
	54	70	52	366	31	84	.....	1,023	.....
	60	70	52	345					

.—From January 1 to March 26 the discharge is approximate; the flow over crest of dam was ted by ice.

Monthly discharge of Honeoye Creek at East Rush, N. Y., for 1906.

[Drainage area, 238 square miles.]

Month.	Discharge in second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.
January	321	29	90.0	0.378
February	196	25	76.8	.323
March	1,110	25	202	.848
April	1,180	121	370	1.55

NOTE.—Above values are rated as approximate.

OSWEGO RIVER BASIN.

DESCRIPTION OF BASIN.

Oswego River is formed by the union of Seneca and Oneida r about 12 miles northwest of Syracuse, N. Y., whence its cour northwestward to Oswego, where it enters Lake Ontario. length of the river from the junction to the mouth is about miles, and the drainage basin along this distance is a narrow str country, moderately rolling. Above the junction of Seneca Oneida rivers the basin spreads out, attaining an extreme width and west of about 100 miles and north and south of from 70 miles.

The most remarkable feature of the drainage basin is the cha lakes stretching across its southern border. From west to eas principal lakes are, in order, Canandaigua, Keuka, Seneca, Ca Owasco, Skaneateles, and Oneida. These seven lakes include a surface of approximately 280 square miles, increased by four sm lakes—Cross, Onondaga, Otisco, and Cazenovia—to about 295 s miles. The larger of the lakes, Oneida, Cayuga, and Seneca, are for steam-towing navigation, having connection with the Erie Oswego canals. Cayuga and Seneca lakes are noted for their and for the abrupt slopes of their beds The influence of the lak Oswego River is of the utmost importance in contributing t steadiness of its flow.

A fall of 100 feet in the course of the main river is largely ut by seven dams, which also partly canalize the stream. The i vening stretches are covered by the Oswego Canal, which draw water supply from the river.

OSWEGO RIVER AT BATTLE ISLAND, N. Y.

This station was established September 14, 1900, and was di tinued April 30, 1906. It was located 3 miles above the mouth o river and 0.6 mile below the State dam at Battle Island. The ditions at this station and the bench marks are described in W

upply Paper No. 170, page 74, where are given also references to ublications that contain data for previous years.

Daily gage height, in feet, of Oswego River at Battle Island, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	Day.	Jan.	Feb.	Mar.	Apr.
.....	5.9	6.05	5.15	7.4	17.....	5.8	4.88	5.05	8.05
.....	6.35	5.85	5.2	7.65	18.....	5.75	4.68	.....	8.0
.....	6.65	5.0	5.05	7.5	19.....	5.8	4.82	5.05	8.0
.....	6.55	5.15	5.45	7.5	20.....	5.55	4.82	.....	7.85
.....	6.4	5.15	5.92	7.5	21.....	5.45	4.88	.....	7.78
.....	6.25	5.1	5.8	7.5	22.....	6.2	4.88	.....	6.55
.....	5.75	5.25	5.8	7.4	23.....	6.7	4.9	.....	6.95
.....	6.5	5.15	5.7	7.3	24.....	6.95	4.85	.....	6.8
.....	6.6	5.0	5.65	7.8	25.....	6.9	4.75	.....	6.65
.....	6.4	5.0	5.65	8.4	26.....	6.85	5.5	.....	6.5
.....	5.8	4.7	5.0	8.3	27.....	6.6	5.3	6.2	6.45
.....	5.75	5.0	5.65	8.3	28.....	6.1	5.1	6.8	6.4
.....	5.5	4.92	5.5	8.2	29.....	6.4	.....	7.05	6.15
.....	5.25	4.9	5.15	8.05	30.....	6.3	.....	7.2	6.55
.....	5.7	4.82	5.0	7.95	31.....	6.15	.....	7.3	.....
.....	5.75	4.82	5.0	8.25					

NOTE.—Gage height below 5.0 feet on March 18 and March 20 to 26. River does not freeze over entirely gage; shore ice extends from 10 to 50 feet out, leaving an open channel in center of stream. The frozen riod is affected by needle ice at times. Ice period for 1906, from January 31 to February 26, ice 0.5 to 0.8 t thick at gage. Backwater from ice jam below gage on February 26 to 28. During frozen period adings were taken to water surface through a hole cut in ice.

Rating table for Oswego River at Battle Island, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
5.00	7,300	5.70	8,690	6.40	10,120	7.20	11,820
5.10	7,490	5.80	8,890	6.50	10,330	7.30	12,200
5.20	7,690	5.90	9,090	6.60	10,540	7.40	12,700
5.30	7,890	6.00	9,300	6.70	10,750	7.80	13,140
5.40	8,090	6.10	9,500	6.80	10,970	8.00	13,580
5.50	8,290	6.20	9,710	6.90	11,170	8.20	14,020
5.60	8,490	6.30	9,920	7.00	11,390	8.40	14,470

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge easurements made during 1900-1904, and is fairly well defined.

Monthly discharge of Oswego River at Battle Island, N. Y., for 1906.

[Drainage area, 1,990 square miles.]

Month.	Discharge in second feet.			Run-off	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile	Depth in inches.
anuary.....	11,300	7,790	9,610	1.93	2.22
arch [a].....	12,000	7,200	8,670	1.74	1.55
pril.....	14,500	9,610	12,400	2.48	2.77

[a] March 1-19, 27-31; discharge for March 18 estimated.

NOTE.—Values for 1906 are excellent.

CANANDAIGUA OUTLET AT ALLOWAY, N. Y.

A temporary gage was erected by F. P. Williams, at the highway idge across the Canandaigua Outlet at Alloway September 18, 1906. he gage consists of a board divided to feet and tenths, secured ver- ally to the northwest wing wall of the bridge. The zero mark is at

elevation 408.0 and is referred to a bench mark consisting of a chisel draft on the northwest abutment of the bridge having an approximate elevation of 420.25 feet. The gage was read each day from September 18 to October 30, 1906, inclusive, by George Tuscher; observations were taken at 7 a. m., at noon, and at 6 p. m. The mean daily elevation has been obtained by adding together twice the morning reading, plus the noon reading, plus twice the afternoon reading, and dividing the sum by 5. Measurements by means of surface floats were made at a point about 500 feet below the bridge. Current-meter measurements are made on the downstream side of the Alloway Bridge. Owing to regulation by storage in Canandaigua Lake, the flow in the outlet ordinarily fluctuates but little during the day. There are, however, a number of dams in the outlet by which the flow may be temporarily held back as pondage.

Daily gage height, in feet, of Canandaigua Outlet at Alloway, N. Y., for 1906.

Day.	Sept.	Oct.	Day.	Sept.	Oct.
1		0.76	16		0.82
2		.86	17		.90
3		.86	18	0.52	.78
4		.80	19	.56	.90
5		.80	20	.66	1.90
6		.78	21	.78	1.56
7		1.52	22	.78	1.32
8		1.00	23	.96	1.16
9		.86	24	.90	1.16
10		.94	25	.80	1.22
11		1.04	26	.82	1.20
12		1.10	27	.62	1.20
13		1.10	28	.62	1.26
14		.82	29	.80	1.26
15		.76	30	1.08	1.16

SENECA LAKE AT GENEVA, N. Y.

A gaging station was established at the foot of Seneca Lake, October 18, 1905. The record is furnished by the department of public works, Geneva, N. Y., C. T. Church, superintendent. Readings are taken Wednesday night of each week by the engineer, Reynolds Hill, after the pumps are stopped.

The station is at the pump house of the city water supply, about 2 miles south of Geneva, along the west shore of the lake. Two 5-foot sections of galvanized iron gage, divided into feet and tenths, are fastened to a center post in the intake well; elevation of zero referred to United States Geological Survey tablet at Geneva, 440.78.

Drainage areas tributary to Seneca Lake.

	Square miles.
Keuka Lake:	
Above outlet	161
Water surface	17.5
Between Keuka Outlet and Seneca Lake	24.80
Total	203.3

	Square miles.
herine Creek:	
Above Montaur Falls	66.5
Montaur Falls to Seneca Lake	29.9
Total	96.4
Creek	23.5
ther drainage	317.8
Total	641
r surface of Seneca Lake	67.2
Grand total	708.2

Gage heights of Seneca Lake at Geneva, N. Y., 1905-6.

5.	Feet.	1906.	Feet.
ber 25	5.0	May 30	5.2
ber 31	4.8	June 6	5.2
mber 8	4.6	June 13	5.2
mber 15	5.0	June 20	5.3
mber 22	4.3	June 27	5.3
mber 29	4.3	July 4	5.4
mber 6	4.5	July 11	5.5
mber 13	4.4	July 18	5.4
mber 21	4.5	July 26	5.4
mber 30	4.7	August 1	5.3
6..		August 8	(a)
ary 3	4.7	August 15	(a)
ary 10	4.8	August 22	(a)
ary 17	4.6	August 29	5.5
ary 24	4.7	September 5	5.4
ary 31	4.7	September 12	5.2
uary 7	4.5	September 19	5.0
uary 14	4.4	September 26	4.9
uary 21	4.4	October 3	4.8
uary 28	4.3	October 10	4.8
h 7	4.4	October 17	4.7
h 14	4.4	October 24	4.8
h 21	3.9	October 30	4.5
h 28	4.3	November 7	4.4
il 4	4.7	November 14	4.4
il 11	4.9	November 21	4.6
il 18	5.1	November 28	4.5
il 25	5.3	December 5	4.3
2	5.1	December 12	4.4
9	5.1	December 19	4.5
16	5.1	December 26	4.5
23	5.1		

[a] Water over gage.

CAYUGA LAKE AT ITHACA, N. Y.

A gaging station was established at the head of Cayuga Lake August 6, 1905. A staff gage is used, attached to the wall of the breakwater about 150 feet from the light-house. Gage readings are taken once each day during the open season and once a week during the winter by Fred Thomas.

Gage height of Cayuga Lake at Ithaca, N. Y., for 1906.

	Feet.		Feet.
January 6	1.35	July 7	2.1
January 13	1.25	July 14	2.2
January 20	.85	July 21	2.3
January 27	1.10	August 4	2.15
February 3	.65	August 11	2.35
February 10	.55	August 18	2.2
February 17	.40	August 25	2.1
February 24	.35	September 1	2.15
March 3	.50	September 8	2.0
March 10	.70	September 15	1.95
March 17	.65	September 22	1.9
March 24	.35	September 29	1.85
March 31	1.60	October 1	1.85
April 7	1.85	October 6	1.7
April 14	2.30	October 13	1.4
April 21	2.15	October 20	1.65
April 28	1.65	October 27	1.7
May 1	1.65	October 31	1.75
May 5	1.70	November 3	1.3
May 12	1.50	November 10	1.25
May 19	1.35	November 17	.95
May 26	1.10	November 24	1.35
June 2	1.40	November 30	1.2
June 9	1.35	December 1	1.25
June 16	1.50	December 8	1.3
June 23	1.75	December 15	1.4
June 30	1.90	December 29	1.35
July 1	2.1		

SENECA RIVER AT BALDWINSVILLE, N. Y.

This station was established November 12, 1898. It is located at the State dam in Baldwinsville, 12 miles along the river from the junction of Seneca and Oneida rivers. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 76, where are given also references to publications that contain data for previous years.

y discharge, in second-feet, of Seneca River at Baldwinsville, N. Y., for 1906.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4,471	3,474	3,028	5,402	3,984	3,434	2,936	2,131	1,996	2,304	3,444	3,957
.....	4,448	3,248	2,902	5,924	3,928	3,237	3,658	2,096	1,609	2,263	3,294	3,650
.....	4,026	2,229	3,050	5,940	3,989	2,973	3,508	2,106	2,251	2,198	3,277	4,025
.....	4,240	2,669	2,993	6,091	4,179	3,336	3,305	2,073	1,994	2,201	2,937	3,476
.....	4,520	3,276	3,823	6,107	4,421	3,137	3,745	1,951	1,981	2,259	3,345	3,004
.....	4,394	2,750	3,889	6,083	3,733	3,137	3,571	2,728	1,984	2,493	3,265	3,476
.....	3,399	2,681	3,889	5,966	4,493	3,148	3,415	2,670	1,978	1,609	3,218	4,162
.....	3,670	2,609	3,777	5,272	4,352	3,148	3,246	2,670	1,887	2,471	3,123	3,945
.....	3,397	2,475	3,744	5,690	4,233	3,241	3,759	2,508	1,472	2,655	3,017	3,097
.....	3,126	2,491	3,770	6,124	4,288	2,778	3,680	2,508	1,978	2,709	3,062	3,609
.....	3,139	1,875	3,203	6,087	4,131	3,256	3,635	2,356	1,994	2,606	2,665	3,667
.....	3,156	2,434	3,583	6,310	4,006	3,215	3,548	1,950	2,032	2,603	3,199	3,633
.....	3,251	2,491	3,409	6,310	3,617	3,111	3,398	2,440	2,032	2,606	3,452	3,666
.....	3,127	2,491	3,220	6,352	4,133	3,097	3,205	2,381	2,032	2,232	3,494	4,283
.....	3,454	2,441	3,029	6,999	4,018	2,977	2,886	2,251	1,909	2,708	3,705	4,160
.....	3,472	2,424	3,281	6,629	4,103	2,968	3,135	2,251	1,342	2,645	3,867	4,319
.....	3,522	2,494	3,031	6,505	4,133	3,118	3,163	2,183	2,016	2,576	3,850	4,840
.....	3,572	2,134	2,628	6,375	3,991	3,979	2,988	2,107	2,002	2,568	3,635	4,857
.....	3,572	2,651	2,976	6,245	3,910	4,205	2,837	1,771	2,032	2,533	4,139	4,857
.....	3,535	2,461	2,876	6,121	3,252	4,233	3,020	2,121	2,032	2,733	4,327	4,655
.....	3,287	2,742	2,646	5,918	3,777	4,233	2,875	2,311	2,032	2,485	4,381	4,645
.....	3,826	3,005	2,719	5,142	3,734	4,273	2,519	2,300	1,909	3,120	4,649	4,679
.....	3,884	3,107	2,878	5,485	3,731	4,184	2,841	2,267	1,502	3,293	4,730	3,937
.....	4,061	3,435	2,773	5,311	3,460	3,817	2,561	2,210	2,067	3,343	4,955	4,224
.....	4,006	3,331	2,473	5,116	3,460	4,122	2,613	2,117	2,084	3,393	4,703	3,636
.....	3,851	3,605	2,743	4,717	3,210	4,178	2,487	1,703	2,084	3,343	4,595	3,657
.....	3,888	3,730	3,574	4,516	3,027	3,768	2,164	2,345	2,007	3,258	4,755	3,473
.....	3,438	3,253	4,287	4,605	3,337	3,563	2,134	2,011	2,115	2,910	4,633	3,528
.....	3,490	.....	4,922	3,645	3,554	3,373	1,708	2,011	2,004	3,429	4,571	3,720
.....	3,413	.....	5,227	4,334	3,415	3,231	2,309	1,989	1,532	3,443	4,395	3,651
.....	3,313	.....	5,563	.....	3,348	.....	2,203	1,989	.....	3,393	.....	4,237

-There is considerable leakage at this station, which has been quite well determined by current easurements.

Monthly discharge of Seneca River at Baldwinsville, N. Y., for 1906.

[Drainage area, 3,100 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	4,520	3,130	3,680	1.19	1.37
y.....	3,730	1,880	2,790	.900	.94
.....	5,560	2,470	3,420	1.10	1.27
.....	6,630	3,640	5,680	1.83	2.04
.....	4,490	3,030	3,840	1.24	1.43
.....	4,280	2,780	3,400	1.13	1.26
.....	3,760	1,710	3,000	.968	1.12
.....	2,730	1,700	2,210	.713	.82
er.....	2,250	1,340	1,930	.623	.70
er.....	3,440	1,610	2,720	.877	1.01
er.....	4,960	2,660	3,820	1.23	1.37
er.....	4,860	3,060	3,960	1.28	1.48
e year.....	6,630	1,340	3,380	1.09	14.81

-Above values are fair.

SKANEATELES LAKE OUTLET AT WILLOW GLEN, N. Y.

s station was established March 10, 1895. It is located in the e of Willow Glen, 1.5 miles below the foot of Skaneateles Lake. onditions at this station and the bench marks are described in r-Supply Paper No. 170, page 79, where are given also references blications that contain data for previous years.

Daily discharge, in second-feet, of Skaneateles Lake outlet at Willow Glen, N. Y., for 190

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	30	34	30	34	72	67	67	67	70	67	57	
2	30	32	30	30	77	67	67	77	70	67	57	
3	30	32	34	30	83	67	67	77	72	57	57	
4	32	32	30	34	77	67	67	100	70	57	57	
5	34	30	30	34	77	67	67	88	70	57	57	
6	32	30	30	34	77	70	67	88	70	57	57	
7	30	32	30	32	77	67	67	88	70	57	57	
8	30	34	30	32	67	70	67	88	70	57	57	
9	30	32	30	38	71	67	67	88	70	57	57	
10	30	30	30	38	67	70	67	77	70	57	57	
11	30	30	30	36	67	67	67	77	70	57	60	
12	30	30	30	34	67	67	67	77	70	57	60	
13	30	30	30	34	70	67	67	77	67	57	60	
14	30	30	30	34	67	67	67	77	67	57	60	
15	30	30	30	38	67	67	67	77	67	57	60	
16	30	30	30	36	67	70	67	77	67	57	60	
17	30	30	30	34	67	72	70	77	67	57	62	
18	30	30	32	34	67	72	67	77	67	57	62	
19	30	30	34	34	67	70	67	72	67	60	60	
20	30	30	32	34	67	67	67	83	67	57	60	
21	30	30	30	34	67	67	67	77	67	60	57	
22	30	30	30	34	67	67	67	72	67	57	57	
23	32	30	30	34	67	67	67	72	70	57	57	
24	32	30	30	34	67	67	67	72	67	57	57	
25	32	32	30	34	67	67	67	72	67	57	57	
26	32	30	30	34	67	67	67	70	67	57	57	
27	32	30	34	34	70	67	67	70	67	57	57	
28	32	30	34	34	70	67	67	70	67	57	57	
29	32	.....	32	34	67	67	67	70	67	57	57	
30	32	.....	36	62	67	67	67	70	67	57	57	
31	32	.....	38	.....	67	.....	67	70	.....	57	.....	

Monthly discharge of Skaneateles Lake outlet at Willow Glen, N. Y., for 1905-6.

[Drainage area, 74.2 square miles.]

Month.	Discharge in second-feet.			Run-off.[a]	
	In outlet.	Through conduit.	Total.	Sec.-ft. per sq. mile.	Depth inche
1905.					
August	62.8	18.4	81.2	1.09	1
September	76.7	18.6	95.3	1.28	1
October	92.2	18.6	110.8	1.49	1
November	89.5	17.7	107.2	1.44	1
December (1-16)	58.8	17.8	76.6	1.03	1
1906.					
January	30.9	18.1	49.0	.660	
February	30.7	19.7	50.4	.679	
March	31.2	19.7	50.9	.686	
April	35.1	19.4	54.5	.735	
May	69.7	19.2	88.9	1.20	1.
June	67.8	19.2	87.0	1.17	1.
July	67.1	19.2	86.3	1.16	1.
August	77.2	18.9	96.1	1.30	1.
September	68.4	18.6	87.0	1.17	1.
October	57.8	18.6	76.4	1.03	1.
November	58.1	18.6	76.7	1.03	1.
December	55.6	.....	.....	.....	.....

[a] Including diversion for water supply of Syracuse. The flow during January, February, and Mar was slightly affected by ice. On account of slight changes in conditions at weir, values for 190 s rated as approximate.

ONEIDA RIVER NEAR EUCLID, N. Y.

ɜ station was established August 30, 1902. It is located 7 miles ɜam from Three River Point. The conditions at this station ɪe bench marks are described in Water-Supply Paper No. 170, ɜ0, where are given also references to publications that contain or previous years.

Discharge measurements of Oneida River near Euclid, N. Y., in 1906.

e.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	C. C. Covert	245	1,400	3.30	3,490
10.....	do	240	1,010	4.71	1,280
er 21 ..	E. F. Weeks	238	867	a 5.30	705
18.....	do	234	860	a 5.30	906

a Gage heights uncertain.

Daily discharge, in second-feet, of Oneida River near Euclid, N. Y., for 1906.

ɜy.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	3,720	5,240	3,270	4,900	4,180	2,380	2,070	1,570	866	845	1,090	1,980
.....	4,030	5,240	3,100	5,240	4,070	2,380	2,070	1,380	783	783	1,120	1,980
.....	4,030	5,130	3,370	5,240	3,920	2,340	2,070	1,350	742	762	1,190	1,870
.....	4,130	4,900	3,420	5,350	4,130	2,290	2,210	1,140	742	804	1,090	1,970
.....	4,230	4,680	3,570	5,350	4,180	2,250	2,340	907	742	824	1,090	2,260
.....	4,180	4,280	3,720	5,600	4,240	2,110	2,210	907	742	907	1,090	2,370
.....	3,980	4,180	3,720	5,470	4,070	2,250	2,180	907	742	845	1,090	2,370
.....	3,830	3,980	3,570	5,470	3,920	2,420	2,180	990	742	949	1,090	2,540
.....	4,030	3,620	3,470	6,580	3,770	2,590	2,040	990	742	1,070	1,090	2,580
.....	4,230	3,620	3,420	6,970	3,560	2,630	2,000	990	824	907	1,090	2,770
.....	4,030	3,420	3,420	6,330	3,560	2,630	1,920	907	742	990	1,120	2,880
.....	4,030	3,370	3,220	6,330	3,560	2,510	1,920	845	658	990	1,190	2,880
.....	3,830	3,220	3,220	6,520	3,460	2,630	1,780	990	742	990	1,170	2,710
.....	3,620	3,050	3,220	6,710	3,510	2,630	1,780	1,300	658	969	1,090	2,630
.....	3,620	2,880	3,100	6,710	3,670	2,630	1,780	1,240	658	907	1,020	2,630
.....	3,620	2,880	2,880	6,710	3,460	2,550	1,740	1,170	658	928	1,120	2,670
.....	3,570	2,790	2,880	6,970	3,460	2,800	1,640	1,090	658	1,020	1,190	2,710
.....	3,620	2,710	2,880	6,840	3,260	2,800	1,640	1,090	637	1,090	1,270	2,710
.....	3,520	2,540	2,790	6,840	3,210	2,700	1,600	1,140	495	1,120	1,300	2,710
.....	3,570	2,540	2,710	6,580	3,110	2,590	1,500	1,300	679	1,140	1,330	2,830
.....	3,880	2,580	2,630	6,330	2,980	2,420	1,500	1,270	742	990	1,500	2,880
.....	4,230	2,540	2,630	6,330	2,940	2,250	1,500	1,190	742	969	1,570	2,880
.....	4,740	2,790	2,540	6,210	2,800	2,210	1,500	1,090	762	949	1,300	2,880
.....	4,840	2,880	2,370	6,025	2,630	2,180	1,450	1,070	824	949	1,300	3,070
.....	5,180	3,000	2,370	5,840	2,590	2,070	1,400	990	824	949	1,450	2,960
.....	5,350	3,140	2,410	5,545	2,470	2,070	1,380	990	824	949	1,640	2,670
.....	5,350	2,920	2,790	5,205	2,510	2,070	1,300	949	824	949	1,640	2,500
.....	5,240	3,100	3,570	5,130	2,680	2,070	1,300	907	824	1,020	1,680	2,370
.....	5,240	.....	3,930	4,955	2,760	2,070	1,400	949	824	1,090	1,780	2,230
.....	5,130	.....	4,450	4,680	2,590	2,070	1,710	907	886	1,090	1,780	2,580
.....	4,900	.....	4,790	.....	2,470	.....	1,920	866	.....	1,090	.....	2,710

—During January, February, and a part of March the river was partly frozen above dam, but ɪgh to modify flow.

Monthly discharge of Oneida River near Euclid, N. Y., for 1906.

[Drainage area, 1,310 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in
January	5,350	3,570	4,240	3.24	
February	5,240	2,540	3,470	2.65	
March	4,790	2,370	3,200	2.44	
April	6,970	4,680	5,970	4.56	
May	4,240	2,470	3,350	2.56	
June	2,800	2,070	2,390	1.83	
July	2,340	1,300	1,780	1.36	
August	1,570	866	1,080	.824	
September	886	495	744	.568	
October	1,140	762	962	.734	
November	1,780	1,020	1,280	.977	
December	5,050	1,870	2,570	1.96	
The year	6,970	495	2,570	1.98	

NOTE. Above values are good.

ONEIDA CREEK AT KENWOOD, N. Y.

A report of the flow of this stream during the latter portion of low-water season of 1906 has been furnished by the Oneida Com nity. The record includes the flow through a 24-inch Hercules w and a 24-inch Camden water wheel, as well as the flow over the c when any occur. The Camden water wheel was little used du this period. The water was drawn below crest level of Sunset I storage pond and nearly the entire twenty-four hour flow of stream passed through the wheels during the ten and one-fou hours daily run. No adequate records were kept during the three weeks of September. The run of the mill, however, indic that the flow was considerably less than during the period cov by the record. A gaging record of this stream in 1900 showed a m mum flow for several days of 13 to 15 second-feet, or an averag 0.222 second-foot per square mile from a tributary drainage are 63 square miles.

Discharge of Oneida Creek at Kenwood, N. Y., for 1906.

	Second-feet.		Second
September 22	22.5	October 10	
September 24	19.0	October 11	
September 25	17.9	October 12	
September 26	17.3	October 13	
September 27	15.0	October 14	
September 28	13.8	October 15	
September 29	16.2	October 16	
October 1	19.3	October 17	
October 2	13.8	October 18	
October 3	13.8	October 19	
October 5	21.0	October 20	
October 6	26.2	October 21	1
October 7	61.5	October 22	
October 8	16.0	October 23	
October 9	24.7	October 24	

CHITTENANGO CREEK AT CHITTENANGO, N. Y.

station was established May 22, 1901. It is located at the ›treet Bridge in the village of Chittenango and is one-half mile the State dam diverting water for the supply of the summit f Erie Canal. The conditions at this station and the bench are described in Water-Supply Paper No. 170, page 82, where ·en also references to publications that contain data for previ- ars.

scharge measurements of Chittenango Creek at Chittenango, N. Y., in 1906.

e.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	E. F. Weeks	58	170	2.40	329
.....	do	57	1[illegible]	2.11	201
r 7	do		101	1.52	75

'ly gage height, in feet, of Chittenango Creek at Chittenango, N. Y., for 1906.

·.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.05	1.75	1.55	2.05	1.55	1.85	2.2	1.4	1.0	1.6	1.6	1.4
.....	1.95	1.55	1.55	1.95	1.85	1.75	2.0	1.5	1.0	1.6	1.5	1.6
.....	1.95	1.45	2.35	2.05	2.4	1.65	1.8	1.5	1.1	1.4	1.4	1.6
.....	2.3	1.5	2.65	2.2	2.25	1.45	2.0	1.4	1.0	1.5	1.6	1.6
.....	2.2	1.4	2.0	2.5	2.35	1.35	1.8	1.4	1.1	1.4	1.6	1.6
.....	2.15	1.35	1.75	2.45	2.15	1.25	1.6	1.4	1.2	1.6	1.5	2.5
.....	1.95	1.45	1.55	2.35	1.95	1.45	1.6	1.5	1.1	1.6	1.6	1.8
.....	2.0	1.35	1.55	2.3	1.75	2.00	1.5	1.6	1.2	1.5	1.5	1.7
.....	1.95	1.45	1.45	2.35	1.75	1.95	1.4	1.4	1.2	1.5	1.6	1.6
.....	1.95	1.45	1.55	2.95	1.75	1.75	1.6	1.4	1.2	1.6	1.6	1.6
.....	2.0	1.35	1.6	2.8	1.85	1.35	1.4	1.4	1.2	1.6	1.7	1.6
.....	2.0	1.45	1.55	2.45	1.8	1.75	1.5	1.4	1.2	1.5	1.8	1.6
.....	1.95	1.35	1.45	2.25	1.95	1.65	1.4	1.4	1.0	1.4	1.7	1.6
.....	1.9	1.45	1.5	2.4	2.15	1.55	1.4	1.4	1.0	1.6	1.6	1.8
.....	1.9	1.45	1.4	2.85	1.85	1.55	1.4	1.[illegible]	1.2	1.6	1.6	3.2
.....	2.0	1.35	1.35	2.65	1.65	1.8	1.2	1.2	1.2	1.6	1.6	2.4
.....	1.95	1.45	1.4	2.35	1.6	2.1	1.4	1.2	1.2	1.6	1.6	1.8
.....	2.05	1.45	1.45	2.25	1.55	2.75	1.4	1.2	1.3	1.8	2.4	1.6
.....	1.95	1.25	1.5	2.2	2.05	2.8	1.2	1.2	1.2	1.6	2.2	1.4
.....	2.05	1.3	1.4	2.1	1.85	2.5	1.2	1.4	1.3	1.6	1.8	1.2
.....	2.3	2.1	1.35	1.95	1.65	2.2	1.2	1.6	1.6	1.6	1.6	1.0
.....	2.55	2.3	1.45	1.85	1.45	2.05	1.2	1.5	1.7	1.6	1.6	1.8
.....	2.7	1.85	1.5	1.75	1.45	2.5	1.2	1.4	1.6	1.6	1.6	1.8
.....	2.55	1.85	1.45	1.7	1.25	2.45	1.2	1.2	1.5	1.8	1.4	1.6
.....	2.1	2.1	1.55	1.6	1.35	2.25	1.2	1.2	1.4	1.9	1.2	1.6
.....	1.95	2.0	1.9	1.7	1.45	2.05	1.2	1.2	1.5	2.0	1.5	1.5
.....	2.05	1.75	3.7	1.6	3.05	1.95	1.2	1.0	1.6	1.8	1.8	1.4
.....	1.85	1.55	3.15	1.55	2.85	2.15	1.2	1.0	1.5	1.8	1.6	1.4
.....	1.75	.....	2.25	1.6	2.65	2.05	1.3	.8	1.6	[illegible].0	1.4	1.5
.....	1.95	.....	3.15	1.65	2.45	2.15	1.2	1.0	1.6	1.8	1.4	..
.....	1.85	.....	2.75	.....	2.15	.. .	1.2	1.0	.	1.6	.	.

There was no ice obstruction previous to January 23. After this date there was some shore ne ice at gage, varying from 0.25 to 0.6 foot th ck, but the stream was not entirely closed dur- nter. During the frozen period gage heights were taken to water surface through a hole in

Rating table for Chittenango Creek at Chittenango, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.80	20	1.60	85	2.40	275	3.20	630
0.90	25	1.70	100	2.50	315	3.30	680
1.00	30	1.80	115	2.60	355	3.40	735
1.10	35	1.90	135	2.70	395	3.50	790
1.20	40	2.00	155	2.80	440	3.60	850
1.30	50	2.10	180	2.90	485	3.70	910
1.40	60	2.20	210	3.00	530		
1.50	70	2.30	240	3.10	580		

NOTE.—The above table is applicable only for open-channel conditions. It is based on dis measurements made during 1904–1906, and is well defined.

Monthly discharge of Chittenango Creek at Chittenango, N. Y., for 1906.

[Drainage area, 79 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	De in
January	395	108	177	2.24	
February	240	45	87.8	1.11	
March	910	55	169	2.14	
April	508	78	217	2.75	
May	555	45	166	2.10	
June	440	45	164	2.08	
July	210	40	68.9	.872	
August	85	20	52.6	.666	
September	100	30	51.7	.654	
October	155	60	91.6	1.16	
November	275	40	92.7	1.17	
December	630	30	113	1.43	
The year	910	20	121	1.53	

NOTE.—Values are rated as follows: January, March to July, and October to December, good ruary, August, and September, fair.

SALMON RIVER BASIN.

DESCRIPTION OF BASIN.

Salmon River rises in the southwestern part of Lewis County, N flows first southward then northwestward, and enters Lake Ont near Port Ontario. The basin above the gaging station is rolling very sandy, rock lying near the surface in the upper part of the wa shed, where there are also extensive tracts of original forest. region is subject to heavy falls of snow, which sometimes accumul in the forest areas to a depth of several feet and melts gradually du March and April, feeding the stream.

Drainage areas tributary to Salmon River.[a]

	Area.	Total area.
	Sq. miles.	*Sq. miles.*
Salmon River above Osceola	44.04	44.04
Salmon River from Osceola to junction of North Branch	26.03	70.07
North Branch Salmon River:		
Above Mill Creek	83.05	.....
Mill Creek	14.25	.....
From Mill Creek to mouth	2.35	.....
Total	99.65	169.72
Salmon River from North Branch to Salmon Falls	23.70	193.42
Salmon River from Salmon Falls to Beaver Dam Brook	6.05	199.47
Beaver Dam Brook	15.44	214.91
Salmon River from Beaver Dam Brook to Sandbank	1.03	215.94
Salmon River from Sandbank to Orwell Brook	1.28	217.22
Orwell Brook	23.13	240.35
Salmon River from Orwell Brook to Trout Brook	2.10	242.45
Trout Brook	14.40	256.85
Salmon River from Trout Brook to Fox Bridge	1.92	258.77
Salmon River from Fox Bridge to Pulaski	7.49	266.26
Salmon River from Pulaski to mouth	5.90	272.16

[a] From U. S. Geological Survey topographic maps.

SALMON RIVER NEAR PULASKI, N. Y.

This station was established September 5, 1900. It is located at Fox Bridge, near Pulaski, N. Y. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 84, where are given also references to publications that contain data for previous years.

Discharge measurements of Salmon River near Pulaski, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 18	E. F. Weeks	182	787	5.00	3,980
August 18	C. C. Covert	170	198	2.40	94
September 20	do	158	176	2.25	54
October 25	Barrows and Covert	175	312	3.20	450

Daily gage height, in feet, of Salmon River near Pulaski, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.18	3.65	3.42	4.42	4.02	2.92	4.45	2.62	2.30	3.30	3.22	3.50
.....	3.78	3.25	3.30	4.15	3.90	2.88	3.80	2.52	2.30	2.95	3.10	3.15
.....	3.68	3.18	3.60	4.00	4.38	2.82	3.30	2.55	2.38	2.78	3.05	2.92
.....	3.90	3.20	4.25	4.25	4.65	2.80	3.75	2.65	2.65	2.50	3.00	3.10
.....	4.00	3.25	4.12	4.85	4.82	2.78	4.18	2.70	2.55	2.58	3.00	3.10
.....	3.90	3.12	3.72	4.45	4.32	2.95	3.45	2.70	2.40	2.68	2.98	3.18
.....	3.50	3.15	3.65	4.12	3.90	2.92	3.15	2.75	2.38	3.82	2.92	3.40
.....	3.50	3.20	3.50	4.00	3.60	3.65	2.95	2.65	2.40	3.50	2.88	3.25
.....	3.50	3.20	3.42	4.08	3.55	4.35	2.88	2.55	2.32	3.10	2.85	3.22
.....	3.40	3.20	3.42	4.08	3.80	3.65	2.90	2.5	2.30	3.55	2.92	3.15
.....	3.42	3.18	3.20	4.20	3.78	3.45	3.32	2.62	2.30	3.48	3.18	3.10
.....	3.50	3.15	3.25	4.22	3.55	3.18	3.15	2.68	2.25	3.22	3.40	3.00
.....	3.40	3.15	3.10	4.50	3.70	2.98	2.90	2.58	2.25	3.05	3.25	3.00
.....	3.35	3.20	3.08	4.72	5.10	2.95	2.75	2.50	2.30	2.98	3.12	3.05
.....	3.35	3.18	3.08	6.90	4.48	2.82	2.70	2.50	2.25	2.90	2.98	3.25
.....	3.38	3.12	3.05	6.35	3.88	2.80	2.65	2.45	2.25	2.80	2.98	4.50
.....	3.35	3.15	3.02	5.75	3.58	2.80	2.68	2.42	2.28	2.75	2.95	4.30
.....	3.35	3.12	2.95	5.58	3.48	2.80	2.70	2.38	2.25	2.70	3.02	3.70
.....	3.32	3.08	3.00	5.52	3.32	2.88	2.65	2.35	2.20	2.62	4.08	3.32
.....	3.28	3.08	3.00	5.00	3.20	2.82	2.65	2.35	2.25	4.15	3.88	3.25

Daily gage height, in feet, of Salmon River near Pulaski, N. Y., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
21	3.68	3.38	2.98	5.15	3.12	2.72	2.70	2.38	2.25	3.95	3.52	3.20
22	4.40	3.95	2.98	5.10	3.10	2.70	2.72	2.45	2.32	3.45	3.58	3.18
23	5.75	3.92	2.92	5.02	3.02	2.78	2.68	2.45	2.58	3.18	3.52	3.00
24	6.80	3.85	2.98	4.45	3.00	2.80	2.65	2.38	2.72	3.02	3.40	2.95
25	5.40	4.05	2.95	4.20	2.98	2.78	2.60	2.35	2.48	3.12	3.25	3.00
26	4.75	4.30	2.98	4.02	3.00	2.70	2.52	2.35	2.40	3.42	3.22	3.18
27	4.40	3.80	4.45	4.02	3.28	2.62	2.50	2.35	2.40	3.50	3.92	3.10
28	4.12	3.55	5.28	4.08	3.75	2.60	2.50	2.35	2.48	3.48	4.00	3.00
29	3.68	.....	5.2	4.00	3.30	2.68	2.50	2.35	2.45	3.75	4.05	3.00
30	3.70	.....	4.95	4.05	3.12	3.30	2.52	2.35	3.32	3.55	3.50	3.00
31	3.78	.....	4.78	.....	3.00	.....	2.65	2.30	.....	3.40	.....	3.70

NOTE.—Stream not entirely closed by ice during winter period, but channel obstructed at times by needle and anchor ice.

Rating table for Salmon River near Pulaski, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.20	46	3.40	620	4.60	1,980	5.80	4,480
2.30	67	3.50	697	4.70	2,140	5.90	4,780
2.40	93	3.60	781	4.80	2,300	6.00	5,100
2.50	124	3.70	865	4.90	2,470	6.20	5,770
2.60	161	3.80	965	5.00	2,640	6.40	6,530
2.70	204	3.90	1,060	5.10	2,840	6.60	7,340
2.80	253	4.00	1,170	5.20	3,020	6.80	8,190
2.90	307	4.10	1,300	5.30	3,240	7.00	9,070
3.00	364	4.20	1,420	5.40	3,460	7.20	10,000
3.10	422	4.30	1,550	5.50	3,700	7.40	11,000
3.20	480	4.40	1,680	5.60	3,950	7.60	12,000
3.30	550	4.50	1,830	5.70	4,200		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1902 to 1906, and is fairly well defined.

Monthly discharge of Salmon River near Pulaski, N. Y., for 1906.

[Drainage area, 259 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	.....	.....	1,340	5.17	5.96
February	.....	.....	640	2.47	2.57
March	.....	.....	880	3.40	3.92
April	8,620	1,180	2,350	9.07	10.12
May	2,840	349	943	3.64	4.20
June	1,620	161	370	1.43	1.60
July	1,750	124	390	1.51	1.74
August	228	67	125	.483	.56
September	567	46	104	.402	.45
October	1,360	124	519	2.00	2.31
November	1,980	280	606	2.34	2.61
December	1,830	323	554	2.14	2.47
The year	8,620	46	735	2.84	38.51

NOTE.—Values are rated as follows: January to March, fair, on account of ice obstructions; remainder of 1906, good.

BLACK RIVER BASIN.

DESCRIPTION OF BASIN.

Black River rises in the western part of Hamilton County, N. Y., ows southwestward across Herkimer County into Oneida County, urns near Forestport and runs somewhat west of north through ewis County to eastern Jefferson County, and then flows westward o Black River Bay, at the eastern extremity of Lake Ontario. The upper part of the basin is very rugged and mountainous and contains a large number of lakes.

The flow of the river is controlled by storage on its upper tributaries, including Beaver River at Beaver, a series of reservoirs at the headwaters of Moose River, and additional reservoirs at Forestport and on the headwaters of the main river.

Water is diverted from Black River through Forestport feeder to supply the Black River Canal at Boonville. A portion of this diverted water flows northward from Boonville and enters Black River again at Lyons Falls; the remainder flows southward through the Black River Canal and enters the Erie Canal at Rome. The amount of this diversion, which takes place during the season of canal navigation, is not recorded.

BLACK RIVER NEAR FELTS MILLS, N. Y.

This station was established August 29, 1902. It is located at the lam of the Black River Traction Company, near the village of Felts Mills. The dam is 9 miles upstream from Watertown and 7 miles upstream from the old Huntingtonville gaging station on this stream. The conditions[a] at this station and the bench marks are described n Water-Supply Paper No. 170, page 87, where are given also references to publications that contain data for previous years.

Daily discharge, in second-feet, of Black River at Felts Mills, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7,630	5,390	2,970	7,320	4,790	3,220	3,520	1,530	880	2,560	2,240	3,070
2	7,810	4,490	2,740	6,720	4,360	1,920	6,170	1,710	1,420	2,340	2,020	2,030
3	4,640	3,190	2,440	5,230	4,790	1,920	5,280	1,430	1,350	2,010	1,540	2,700
4	4,790	3,080	4,440	4,790	5,530	1,810	5,280	1,450	1,440	1,290	1,470	2,000
5	5,080	2,740	5,390	5,080	6,030	1,920	5,990	300	1,530	1,320	2,400	1,820
6	6,030	2,540	5,080	5,230	6,540	2,040	2,760	1,620	1,560	1,370	1,530	1,610
7	4,600	2,540	4,220	5,080	6,720	2,170	2,810	1,590	1,060	1,720	1,450	2,200
8	5,550	2,350	3,560	4,440	5,530	1,920	2,240	1,790	1,260	2,380	1,430	2,020
9	5,080	2,350	3,190	5,080	4,940	2,290	2,540	1,680	880	2,190	1,500	1,750
10	3,690	2,350	2,540	4,190	4,360	2,250	2,420	1,500	980	2,130	1,370	2,260
11	3,440	2,950	2,540	4,350	4,360	2,950	2,810	1,470	980	2,090	1,470	1,780
12	3,310	2,740	3,690	4,790	4,360	3,520	3,050	1,080	700	2,500	2,410	1,860
13	3,190	2,160	2,540	5,390	3,900	3,220	2,540	1,410	1,410	2,060	2,320	1,780
14	2,680	2,160	2,540	5,870	8,030	3,220	2,040	1,440	1,380	2,120	2,230	2,390
15	2,630	2,740	2,540	6,930	8,400	2,170	1,170	1,830	1,240	1,790	2,150	1,880

[a] Owing to high water it was impossible to obtain a profile of the crest of this dam until August, 1906. Previous estimates for this station have been made from elevations taken at the ends of the crest, and the dam assumed to be level. The 1906 profile shows more or less settlement near the center; ence an increase in discharge of about 10 per cent for the same gage height over previous estimates. The dam was constructed in 1900, and the recomputations are based on the assumption that the settlement has been proportionate each year.

Daily discharge, in second-feet, of Black River at Felts Mills, N. Y., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Dec.	Dec.
16	2,630	2,350	2,350	9,830	9,210	1,920	1,360	1,220	890	1,560	2,030	2,810
17	2,540	2,160	1,990	13,400	8,790	2,290	1,470	1,110	1,220	1,470	2,110	3,340
18	4,490	1,920	1,360	14,200	8,010	3,370	1,470	840	1,280	1,440	2,120	2,890
19	3,690	2,970	2,440	12,900	6,030	2,950	1,470	80	960	1,440	5,230	2,940
20	3,600	1,990	1,910	11,900	4,870	2,040	1,080	1,700	1,480	2,380	5,210	2,740
21	3,220	1,990	1,630	11,600	3,220	1,920	1,080	1,300	1,180	3,570	4,730	2,490
22	7,710	4,790	2,250	11,300	3,220	1,990	1,080	1,440	970	3,640	4,590	2,270
23	13,400	4,490	1,750	11,000	3,220	1,700	1,850	1,680	590	3,120	4,140	1,700
24	18,100	4,490	2,070	10,500	2,680	1,700	1,380	1,910	1,700	2,560	3,580	1,280
25	18,800	4,440	1,360	10,000	2,540	1,920	1,840	1,540	1,660	2,180	3,160	1,080
26	19,000	5,710	2,250	8,590	2,420	1,810	1,230	1,310	1,550	2,280	3,130	1,970
27	19,000	4,490	2,630	7,260	3,220	1,470	1,070	1,840	1,180	2,370	2,990	1,710
28	11,600	4,490	6,370	6,370	4,120	1,410	870	1,300	1,040	2,420	5,030	1,650
29	9,000	.....	7,630	5,450	5,100	1,430	800	1,280	860	3,740	4,500	1,620
30	6,200	.....	7,260	5,710	5,100	723	1,650	1,350	1,150	2,940	3,750	1,470
31	6,030	.....	7,440	.....	3,960	.....	1,330	1,390	.....	2,670	.....	2,390

NOTE.—The Harmon Paper Company began operations January 2, using a part of the flow; and no records were kept of run of wheels or tailrace gage until after May 1; hence the discharges for this period are considerably in error. On October 26 and 27 and November 17 and 18, the crest of dam was obstructed by logs. The following ice conditions prevailed during December, 1906: December 1 to 4, anchor ice in wheel racks, river partly frozen over; December 7, pond frozen over, ice within 75 feet of crest of dam; December 8, ice up to crest; December 21, ice frozen on crest and holding water back; December 31, ice gone from crest.

Monthly discharge of Black River at Felts Mills, N. Y., for 1906.

[Drainage area, 1,850 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	19,000	2,540	7,070	3.82	4.40
February	5,710	1,920	3,220	1.74	1.61
March	7,630	1,360	3,330	1.80	2.08
April	14,200	4,350	7,710	4.17	4.65
May	3,210	2,420	5,110	2.76	3.18
June	3,520	723	2,170	1.17	1.30
July	6,170	800	2,310	1.25	1.44
August	1,910	80	1,390	.750	.86
September	1,700	590	1,190	.643	.72
October	3,740	1,290	2,280	1.23	1.42
November	5,230	1,350	2,790	1.51	1.68
December	3,340	1,080	2,110	1.14	1.31
The year	19,000	80	3,380	1.83	24.8[illegible]

NOTE.—Values May to December are rated as good; prior to May the probable error is greater than 10 per cent.

MOOSE RIVER AT MOOSE RIVER, N. Y.

This station was established June 5, 1900. It is located at Moose River village. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 89, where are given also references to publications that contain data for previous years.

Discharge measurements of Moose River at Moose River, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 7	Covert and Weeks	217	730	2.52	79
September 22	C. C. Covert	212	440	.97	23
September 23	do	215	630	1.72	52
September 24	do	213	596	1.68	45

Daily gage height, in feet, of Moose River at Moose River, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.92	2.78	2.53	2.58	3.38	2.03	2.83	1.73	0.90	1.95	1.10	2.25
.....	2.67	2.68	2.43	2.58	3.33	1.88	3.43	1.68	.80	1.20	1.50	2.00
.....	2.72	2.53	2.33	2.48	4.28	1.73	2.93	1.73	.95	1.20	1.50	1.70
.....	2.72	2.38	2.58	2.38	4.38	1.63	3.18	1.73	1.60	1.00	1.40	1.60
.....	2.72	2.23	2.68	2.63	4.43	1.53	2.93	1.63	1.20	.90	1.40	1.40
.....	2.62	2.03	2.48	2.73	4.93	1.43	2.43	1.63	.75	1.05	1.40	1.55
.....	2.52	1.93	2.28	2.53	4.53	1.53	3.13	1.53	.60	1.25	1.50	1.60
.....	2.52	2.03	2.13	2.33	4.23	2.38	1.78	1.28	.50	1.40	1.40	1.70
.....	2.62	2.03	2.03	2.23	3.33	3.63	1.88	1.03	.50	1.30	1.50	1.55
.....	2.72	2.03	2.03	2.23	3.33	3.18	1.83	1.03	.55	1.25	1.50	1.35
.....	2.62	2.13	1.93	2.43	3.13	2.73	1.73	.93	.85	1.70	1.60	1.15
.....	2.57	2.13	1.83	2.38	3.03	2.53	1.63	1.03	1.00	1.65	1.60	1.20
.....	2.42	2.03	1.73	2.23	4.28	2.38	1.73	1.13	1.00	1.65	1.70	1.35
.....	2.27	1.93	1.68	2.43	6.13	1.98	1.73	1.03	1.30	1.65	1.65	1.60
.....	2.22	1.93	1.63	5.73	5.13	1.83	1.63	.93	1.00	1.45	1.70	1.70
.....	2.12	2.03	1.63	5.98	4.28	1.73	1.53	.83	1.00	1.40	1.85	1.75
.....	2.12	2.03	1.63	5.23	4.13	1.98	1.43	.73	.90	1.40	2.20	1.80
.....	2.25	2.13	1.53	5.03	3.98	1.83	1.38	.73	.00	1.50	2.85	1.75
.....	2.45	2.13	1.53	5.33	3.78	1.93	1.28	.63	.65	1.65	3.05	1.60
.....	2.40	2.28	1.43	5.43	3.33	1.93	1.18	.63	.85	2.20	2.95	1.50
.....	3.47	2.53	1.23	5.58	2.93	1.83	1.13	1.03	.75	2.05	2.75	1.50
.....	3.97	2.78	1.43	5.83	2.63	1.83	1.03	1.23	.80	2.00	2.55	1.40
.....	5.27	2.93	1.53	5.33	2.28	1.73	1.03	1.33	1.65	2.05	2.35	1.40
.....	7.77	3.03	1.63	4.63	2.18	1.73	.93	1.43	1.60	1.90	2.15	1.40
.....	5.27	3.08	1.73	4.28	2.08	1.78	.93	1.53	1.65	1.80	1.95	1.30
.....	4.72	2.98	1.73	3.93	2.83	1.73	.93	1.53	1.25	1.70	2.15	1.30
.....	4.37	2.78	2.13	3.83	3.38	1.63	.83	1.53	.95	1.80	2.50	1.30
.....	4.08	2.63	2.53	3.53	3.93	1.53	.83	1.43	.75	1.90	2.75	1.20
.....	3.53	.....	2.73	3.13	3.48	1.43	.83	1.33	1.15	1.80	2.95	1.20
.....	3.28	.....	2.68	3.48	2.93	1.83	.93	1.33	1.90	1.60	2.55	1.20
.....	2.93	.....	2.63	.....	2.43	.....	1.78	1.23	.....	1.35	.....	1.20

TE.—The river was not entirely closed by ice during 1906. There was considerable shore ice during tter part of February and through March, ice going out the 4th of April. At times needle ice forms e rifts below the gage and causes backwater. During the frozen period, gage heights were taken to surface through a hole in the ice.

Rating table for Moose River at Moose River, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.00	103	1.40	354	2.80	914	5.40	3,180
0.10	115	1.50	382	2.90	968	5.60	3,440
0.20	127	1.60	412	3.00	1,023	5.80	3,700
0.30	140	1.70	444	3.20	1,139	6.00	3,980
0.40	154	1.80	477	3.40	1,264	6.20	4,260
0.50	170	1.90	511	3.60	1,399	6.40	4,555
0.60	187	2.00	547	3.80	1,545	6.60	4,855
0.70	205	2.10	585	4.00	1,700	6.80	5,160
0.80	223	2.20	626	4.20	1,870	7.00	5,480
0.90	242	2.30	669	4.40	2,060	7.20	5,800
1.00	262	2.40	715	4.60	2,260	7.40	6,130
1.10	282	2.50	763	4.80	2,480	7.60	6,470
1.20	304	2.60	812	5.00	2,700	7.80	6,810
1.30	328	2.70	862	5.20	2,940		

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1903–1906, and is well defined between gage heights 1.0 foot and 5.0 feet. urements above gage height 6.0 feet are impossible at this station, owing to the flashy character of tream and to large quantities of ice and logs running during high stages. Hence discharges of over second-feet are liable to error.

Monthly discharge of Moose River at Moose River, N. Y., for 1906.

[Drainage area, 346 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	6,760	593	1,330	3.82	4.40
April	3,960	639	1,710	4.94	5.51
May	4,160	577	1,530	4.42	5.10
June	1,420	362	557	1.61	1.80
July	1,280	228	500	1.45	1.67
August	454	192	324	.936	1.08
September	511	[a] 103	267	.772	.86
October	636	242	413	1.19	1.37
November	1,050	282	580	1.68	1.87

[a] The low minimum for September was caused by the storage of water by the dam at McKeever.

NOTE.—Values are rated as follows: January to May and September, good; June to August, October, and November, excellent.

ST. LAWRENCE RIVER DRAINAGE.

GENERAL FEATURES.

St. Lawrence River receives the flow of a number of New York streams having their sources in a northerly slope of the Adirondacks and fed by the innumerable lakes with which the region is dotted. Some of these rivers, as the Grass, Raquette, and St. Regis, lie entirely within the United States; others, notably Salmon, Trout, Chateaugay, and English rivers, cross the international boundary and flow northward into the St. Lawrence in Canada, as does also Richelieu River, the outlet of Lake Champlain. The following table gives a list of the principal tributaries of the St. Lawrence in the United States, with the areas drained by them:

Drainage areas of St. Lawrence River tributaries in the United States.

	Square miles.		Square miles.
Oswegatchie River	1,609	Salmon River [a]	273
Grass River	637	Trout River [b]	129
Raquette River	1,219	Chateaugay River [b]	199
St. Regis River	910	English River [b]	53
Little Salmon River [a]	103	Lake Champlain [b]	8,187

The St. Lawrence drains, through Lake Champlain, an area of 4,56 square miles in the State of Vermont. This drainage is practically all from Missisquoi, Lamoille, and Winooski rivers and Otter Creek.

OSWEGATCHIE RIVER BASIN.

DESCRIPTION OF BASIN.

Oswegatchie River has its source in the region of lakes and timbered swamps in the southern part of St. Lawrence County, N. Y.

[a] Above junction near international boundary.

[b] Above New York State line.

The largest of the lakes is Cranberry Lake, which affords valuable storage to water-power users on its outlet, East Branch of Oswegatchie River. East and West branches flow in a general northwesterly direction and unite near Talcville. From Gouverneur to Oxbow the river flows southwestward; it then turns sharply and flows northeastward to Rensselaer Falls, turns again to the northwest, receives the outlet of Black Lake at Galilee, and finally enters the St. Lawrence at Ogdensburg.

OSWEGATCHIE RIVER NEAR OGDENSBURG, N. Y.

This station was established May 16, 1903. It is located at Eel Weir Bridge, just below the junction of Oswegatchie River and Black Lake outlet. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 93, where are given also references to publications that contain data for previous years.

Discharge measurements of Oswegatchie River near Ogdensburg, N. Y., in 1903-1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1903.					
May 5	Covert and Halsey	.....	269	4.70	1,040
May 14	H. H. Halsey	.....	256	4.60	830
May 14	do	.....	256	4.60	729
September 22	C. C. Covert	.....	261	4.70	812
1904.					
April 8	Covert and Swancott	.....	1,170	8.10	9,460
April 10	do	.....	1,180	8.05	9,550
July 4	C. C. Covert	.....	306	4.80	1,210
October 23	A. M. Evans	.....	549	5.68	2,410
October 23	do	.....	536	5.64	2,370
1905.					
March 26	Horton and Mott	269	1,200	8.02	9,210
March 26	do	269	1,250	8.15	9,010
April 14	C. C. Covert	267	1,000	7.24	7,240
April 16	do	267	975	7.12	6,930
April 17	do	267	935	6.92	6,190
1906.					
April 19	C. C. Covert	267	854	6.60	5,430
April 20	do	267	842	6.60	5,380
August 16	Covert and Weeks	240	377	4.90	987
October 27	Barrows and Covert	254	814	6.61	4,640

Daily gage height, in feet, of Oswegatchie River near Ogdensburg, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.2	7.0	5.75	6.8	5.55	5.2	4.9	4.7	4.5	4.65	6.4	6.6
2	7.4	6.85	5.4	6.65	5.4	5.1	4.9	4.7	4.5	4.7	6.35	6.55
3	7.3	6.5	5.25	6.5	5.5	5.1	4.85	4.7	4.5	4.75	6.15	6.45
4	7.2	6.15	5.25	6.55	5.55	5.0	4.9	4.95	4.5	4.8	6.0	6.25
5	7.2	6.0	5.6	6.3	5.5	5.0	5.05	5.1	4.55	4.8	5.95	6.05
6	7.1	5.9	5.7	6.1	5.7	4.9	5.3	5.3	4.75	4.95	5.85	5.9
7	7.1	5.7	5.7	6.05	5.65	4.8	5.45	5.35	4.9	5.1	5.7	5.9
8	7.1	5.55	5.65	5.9	5.55	5.25	5.55	5.2	4.9	5.3	5.7	5.95
9	6.85	5.45	5.55	5.9	5.55	5.75	5.55	5.1	4.85	5.75	5.7	5.95
10	6.8	5.4	5.45	5.9	5.5	6.2	5.5	5.0	4.8	5.75	5.55	5.8

Daily gage height, in feet, of Oswegatchie River near Ogdensburg, N. Y., for 1
Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
11	6.65	5.3	5.4	5.95	5.5	6.4	5.5	5.0	4.8	5.75	5.4
12	6.4	5.2	5.25	6.1	5.4	6.5	5.4	4.8	4.8	6.0	5.4
13	6.35	5.1	5.2	6.15	5.4	6.6	5.4	4.8	4.8	6.1	5.65
14	6.2	5.1	5.2	6.3	5.35	6.5	5.4	4.8	4.8	6.1	5.65
15	6.05	5.1	5.15	6.2	5.55	6.4	5.4	4.75	4.8	6.15	5.4
16	5.9	5.0	5.1	6.25	5.6	6.35	5.4	4.75	4.8	6.1	5.45
17	5.9	5.0	5.1	6.25	5.95	6.15	5.3	4.7	4.8	6.1	5.4
18	5.85	4.9	5.1	6.35	5.95	6.0	5.2	4.7	4.7	6.05	5.45
19	6.1	4.9	5.1	6.45	5.9	6.0	4.95	4.6	4.7	6.0	5.65
20	5.85	4.9	5.0	6.5	5.85	5.8	4.9	4.6	4.7	6.1	5.7
21	5.85	5.0	5.0	6.5	5.85	5.65	4.9	4.6	4.6	6.1	5.7
22	6.3	5.2	4.95	6.35	5.65	5.55	4.9	4.55	4.6	6.55	6.6
23	7.15	5.65	4.9	6.3	5.6	5.4	4.9	4.45	4.6	6.65	6.45
24	7.45	5.7	4.85	6.3	5.55	5.4	4.8	4.4	4.6	6.65	6.35
25	7.8	5.8	4.75	6.25	5.4	5.4	4.8	4.4	4.6	6.7	6.35
26	7.9	5.9	4.7	6.2	5.4	5.3	4.8	4.5	4.6	6.7	6.3
27	8.1	5.85	5.0	6.2	5.15	5.15	4.8	4.5	4.6	6.6	6.3
28	7.95	5.85	5.5	6.0	5.2	5.1	4.7	4.5	4.6	6.7	6.35
29	7.9	.....	6.1	5.9	5.2	5.1	4.7	4.5	4.75	6.65	6.5
30	7.55	.....	6.65	5.9	5.25	4.9	4.7	4.5	4.7	6.45	6.55
31	7.3	.....	6.8	.....	5.2	.....	4.7	4.5	.....	6.3	.....

NOTE.—The river never freezes over at the gage owing to the swift current. Ice forming on about one-half mile below, occasionally causes backwater.

Rating table for Oswegatchie River near Ogdensburg, N. Y., for 1903–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.40	590	5.60	2,400	6.80	5,775	8.00	9,350
4.50	680	5.70	2,640	6.90	6,070	8.20	9,960
4.60	780	5.80	2,890	7.00	6,365	8.40	10,570
4.70	890	5.90	3,160	7.10	6,660	8.60	11,180
4.80	1,010	6.00	3,440	7.20	6,955	8.80	11,790
4.90	1,140	6.10	3,730	7.30	7,250	9.00	12,400
5.00	1,280	6.20	4,020	7.40	7,550	9.20	13,020
5.10	1,440	6.30	4,310	7.50	7,850	9.40	13,640
5.20	1,610	6.40	4,600	7.60	8,150	9.60	14,260
5.30	1,790	6.50	4,890	7.70	8,450	9.80	14,880
5.40	1,980	6.60	5,185	7.80	8,750	10.00	15,500
5.50	2,180	6.70	5,480	7.90	9,050		

NOTE.—The above table is applicable only for open-channel conditions. It is based on nineteen charge measurements made during 1903–1906. Although the discharge measurements plot some erratically, the curve may be considered fairly well defined owing to the constancy of conditions of from year to year.

Monthly discharge of Oswegatchie River near Ogdensburg, N. Y., for 1903–1906.

[Drainage area, 1,580 square miles.]

Month.	Discharge in second-feet			Run-off.
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
1903.				
April (22-30)	4,020	1,790	2,670	1.69	
May	1,520	590	903	.572	
June	2,180	590	1,210	.766	
July	1,790	680	1,220	.772	
August	2,890	950	2,070	1.31	
September	1,010	680	875	.554	
October	5,480	680	3,090	1.96	
November	2,400	1,010	1,660	1.05	
December	1,610	890	1,060	.671	

rge of Oswegatchie River near Ogdensburg, N. Y., for 1903–1906—Cont'd.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1904.					
.....	3,880	780	1,400	0.886	1.02
.....	1,980	1,280	1,610	1.02	1.10
.....	15,300	1,610	6,150	3.89	4.48
.....	14,300	4,160	7,860	4.97	5.54
.....	5,480	1,790	3,260	2.06	2.38
.....	2,520	780	1,360	.861	.96
.....	1,610	780	1,120	.709	.82
.....	1,520	680	1,020	.646	.74
.....	3,730	1,140	1,460	.924	1.03
.....	5,180	1,980	3,040	1.92	2.21
.....	2,890	780	1,480	.937	1.05
.....	1,520	680	838	.520	.61
.....	15,300	680	2,550	1.61	21.94
1905.					
.....	5,620	890	1,830	1.16	1.34
.....	890	680	796	.504	.52
.....	15,800	680	3,750	2.37	2.73
.....	15,800	2,760	7,470	4.73	5.28
.....	4,160	2,180	2,960	1.87	2.16
.....	5,480	1,790	4,000	2.53	2.82
.....	5,480	1,440	2,770	1.75	2.02
.....	3,730	1,440	2,310	1.46	1.68
.....	2,400	1,140	1,710	1.08	1.20
.....	2,160	1,010	1,690	1.07	1.23
.....	3,160	1,610	2,210	1.40	1.56
.....	6,660	1,440	3,120	1.97	2.27
.....	15,800	680	2,886	1.82	24.81
1906.					
.....	9,660	3,020	6,070	3.84	4.43
.....	6,360	1,140	2,520	1.59	1.66
.....	5,780	890	2,030	1.28	1.48
.....	5,780	3,160	4,120	2.61	2.91
.....	3,300	1,520	2,280	1.44	1.66
.....	5,180	1,010	2,600	1.65	1.84
.....	2,200	890	1,460	.924	1.07
.....	1,880	560	977	.618	.71
.....	1,140	680	886	.561	.63
.....	5,480	825	3,410	2.16	2.49
.....	5,180	1,980	3,320	2.10	2.34
.....	5,180	1,790	2,910	1.84	2.12
.....	9,660	560	2,720	1.72	23.34

alues 1903–1906 are rated as good.

RAQUETTE RIVER BASIN.

DESCRIPTION OF BASIN.

River drains a long, narrow basin extending from northern ounty to St. Lawrence River. Its sources are on an ele- au, dotted with mountains interspersed with lakes. The bered, but numerous marsh and swamp areas exist, many on the divide and feed streams flowing in opposite direc- lakes of the headwaters afford ample opportunities for elopment.

ons at the dam of the Hannawa Falls Power Company rom September, 1902, to March 31, 1903. The discharge a computed. The Sunday flow of this stream, like many

others in this State, is often held back during the low-water season while ponds at mills above are being refilled. Where there is extensive pondage of this character the resultant effect may be shown in the stream for several days.

RAQUETTE RIVER AT MASSENA SPRINGS, N. Y.

This station was established at the highway bridge at Massena Springs, September 21, 1903. Observations were continued until October 17, 1903, when the station was temporarily abandoned. It was resumed April 9, 1904. The conditions at this station and the bench marks[a] are described in Water-Supply Paper No. 170, page 94, where are given also references to publications that contain data for previous years.

Discharge measurements of Raquette River at Massena Springs, N. Y., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 19	C. C. Covert	176	954	5.38	[illegible]
April 20	do	176	975	5.55	3,300
August 14	Covert and Weeks	175	581	3.28	1,440
August 15	E. F. Weeks	175	426	2.53	1,010
October 27	Barrows and Covert	172	629	2.45	1,700

Daily gage height, in feet, of Raquette River at Massena Springs, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.2	6.65	5.5	4.0	5.85	5.45	3.55	3.6	2.2	2.25	2.2	[illegible]
2	4.75	6.45	5.15	5.1	5.75	5.5	4.0	3.45	1.5	2.4	2.5	[illegible]
3	4.8	6.25	5.1	5.2	5.55	5.75	2.9	2.15	2.1	2.35	3.35	4.75
4	5.7	5.8	5.0	4.55	5.5	5.3	2.5	2.9	2.0	2.2	2.2	5.55
5	5.8	6.2	4.65	4.15	5.5	5.35	4.15	1.8	1.95	2.1	2.15	[illegible]
6	5.8	5.8	4.55	4.0	5.5	5.5	4.0	2.85	1.85	2.1	2.15	[illegible]
7	4.4	5.75	4.45	4.0	5.5	5.4	4.1	2.9	1.8	1.6	2.0	[illegible]
8	5.65	5.95	4.6	3.75	5.5	5.55	3.65	2.8	1.8	2.05	2.4	[illegible]
9	5.8	6.0	4.75	4.05	5.6	6.3	3.95	2.8	1.65	2.15	2.05	[illegible]
10	5.7	6.1	4.9	3.95	5.45	5.95	4.0	2.9	2.8	2.2	2.25	[illegible]
11	5.7	5.75	4.9	3.8	5.75	6.45	4.0	2.9	2.8	2.45	2.05	[illegible]
12	5.55	6.5	4.75	3.7	5.55	5.9	4.0	2.05	2.7	2.5	2.4	[illegible]
13	5.25	6.05	4.7	3.75	5.1	5.8	4.0	2.85	2.65	2.5	2.35	[illegible]
14	4.75	6.0	4.7	3.7	6.9	5.75	3.9	2.75	2.6	2.0	2.05	[illegible]
15	5.55	5.9	4.7	3.05	6.45	5.7	3.25	2.15	2.6	2.5	2.75	[illegible]
16	5.3	5.95	4.55	5.3	6.3	5.7	4.0	2.1	1.8	2.5	2.7	[illegible]
17	4.95	5.95	4.45	5.1	6.25	5.65	4.0	2.25	2.6	2.6	3.05	[illegible]
18	5.0	5.6	4.35	5.75	6.05	5.95	4.0	2.3	2.7	2.6	2.6	[illegible]
19	5.05	5.8	4.2	5.6	5.85	5.6	4.0	1.2	2.7	2.6	4.05	[illegible]
20	5.3	5.7	4.2	5.25	5.05	5.35	4.0	1.95	2.7	2.6	3.95	[illegible]
21	5.7	5.75	4.1	5.5	5.85	5.05	3.85	1.85	2.6	2.2	2.6	[illegible]
22	9.65	5.85	4.3	5.25	5.70	4.75	3.5	1.8	2.6	2.9	2.8	[illegible]
23	10.6	6.0	4.6	6.1	5.65	4.55	3.05	1.75	1.7	2.9	2.8	[illegible]
24	9.05	6.0	4.7	5.95	5.55	4.1	2.55	1.7	2.05	2.9	2.85	[illegible]
25	7.5	5.85	3.45	6.05	5.45	4.0	2.4	1.7	2.7	2.85	2.5	5.7

[a] During 1906 the vertical staff gage used in previous years was replaced by a standard chain gage, length of chain 28.84 feet. All 1906 gage heights are referred to its datum, which is 1 foot below that of the staff gage. Previous gage heights should have 1 foot added to correspond to those of 1906. The gage was read during 1906 by G. T. Buffum and C. A. Waitt. The bench mark is on the upstream corner of the right abutment; elevation 25.29 feet. The reference point is on the end of the needle beam to sidewalk near the zero of gage scale; elevation 24.31 feet; elevations are above the datum of the new gage.

y gage height, in feet, of Raquette River at Massena Springs, N. Y., for 1906—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	7.3	5.8	4.7	6.0	5.40	4.0	3.5	1.45	2.7	4.65	4.05	5.2
.....	7.05	5.75	5.2	5.85	4.80	4.0	2.5	1.9	2.65	3.85	4.15	6.3
.....	6.65	5.7	6.3	5.65	4.95	4.0	3.5	1.95	2.6	3.4	4.1	6.1
.....	6.3	.....	6.45	4.85	5.15	4.0	2.8	2.1	2.6	3.85	3.95	5.2
.....	6.75	.....	6.15	5.9	5.25	3.9	3.7	2.2	1.5	3.6	4.1	6.3
.....	6.9	.....	5.8	.....	5.35	.....	3.8	2.2	.....	3.15	.....	5.6

RE.—The following ice conditions prevailed during 1906: River began to freeze over about the e of January, one-fourth mile below gage being entirely closed; ice about 0.65 foot thick. Freezing at the gage about February 1; February 28 ice all gone at gage; river still frozen over about one- mile below. Ice went out of river about March 31. Needle ice forms at times and causes back- . December 2, river began filling with needle ice below gage, causing a rise of nearly 4 feet. Dur- e frozen period in December gage heights were taken to top of ice. The following comparative gs were also taken:

Date.	Water surface.	Top of ice.	Thickness of ice at gage.
	Feet.	*Feet.*	*Feet.*
ber 15	7.5	7.4	[a] 0.65
ber 19	6.5	6.7	[a] .83
ber 22	6.8	6.9	.83
ber 26	5.0	5.2	1.16
ber 29	4.9	5.2	[b] 1.70

[a] Anchor ice. [b] Anchor ice gone.

Rating table for Raquette River at Massena Springs, N. Y., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	265	2.60	1,005	3.90	2,040	5.40	3,435
1.30	310	2.70	1,070	4.00	2,130	5.60	3,625
1.40	355	2.80	1,140	4.10	2,220	5.80	3,820
1.50	400	2.90	1,210	4.20	2,310	6.00	4,020
1.60	445	3.00	1,285	4.30	2,400	6.20	4,220
1.70	495	3.10	1,360	4.40	2,430	6.40	4,420
1.80	545	3.20	1,435	4.50	2,580	6.60	4,620
1.90	595	3.30	1,515	4.60	2,675	6.80	4,820
2.00	650	3.40	1,595	4.70	2,770	7.00	5,020
2.10	705	3.50	1,680	4.80	2,865	8.00	6,020
2.20	760	3.60	1,770	4.90	2,960	9.00	7,020
2.30	820	3.70	1,860	5.00	3,055	10.00	8,020
2.40	880	3.80	1,950	5.20	3,245	11.00	9,020
2.50	940						

RE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1904-1906, and is well defined below gage height 7 feet.

Monthly discharge of Raquette River at Massena Springs, N. Y., for 1906.

[Drainage area, 1,170 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
ry	8,620	2,460	4,140	3.54	4.08
	4,470	1,640	2,910	2.49	2.87
	4,120	1,320	2,920	2.50	2.79
	4,920	2,800	3,640	3.11	3.58
	4,470	2,040	3,250	2.78	3.10
	2,260	940	1,900	1.62	1.87
st	1,770	265	875	.748	.86
mber	1,140	400	851	.727	.81
ber	2,180	445	1,100	.940	1.08
mber	2,260	700	1,600	1.37	1.53

RE.—Values are rated as follows: January and March, fair; April to November, excellent.

LAKE CHAMPLAIN DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Lake Champlain occupies a long and narrow valley, extending in a north-south direction, and forming a part of the boundary between New York and Vermont. The elevation of the lake is about 95 feet above tide, and the water-surface area is 436 square miles.

The drainage basin is irregular in form, being about 75 miles wide from a point opposite Middlebury, Vt., northward to the outlet of the lake at Rouse Point, on the international boundary. South of Middlebury the average width of the basin is about 35 miles and the lake itself is very narrow, forming virtually a drowned river. The drainage is received almost entirely through large tributaries, there being little direct coast drainage into the lake. The outlet of the lake is Richelieu River, which flows northward from Rouse Point to St. Lawrence River.

In estimating the run-off from this basin in previous years the drainage area has been taken as 7,500 square miles. The areas of the tributary basins are given in Water-Supply Paper No. 170, pages 97–98.

The land drainage area above Rouse Point is 7,463 square miles; hence the run-off as heretofore computed represents substantially the outflow expressed as depth in inches on the land surface. As the precipitation on the lake probably exceeds the evaporation, the water surface of the lake, 436 square miles, should be added to the land area and the run-off computed for the whole drainage basin, 7,899 square miles.

The daily discharge of the lake has been determined from observations of the depth and discharge over the Chambly dam, 35 miles below the head of Richelieu River, made in 1898 by the United States Board on Deep Waterways. A rating table has been derived from the observations at the Chambly dam and the gage readings taken at Rouse Point. The area tributary to the river between Rouse Point and Chambly is 310 square miles, making the total drainage basin above Chambly 8,209 square miles.

RICHELIEU RIVER AT FORT MONTGOMERY, N. Y.

A record of the height of Lake Champlain at Rouse Point, at the head of Richelieu River, the outlet of the lake, has been kept by the United States Corps of Engineers, beginning in 1875. Through the courtesy of Capt. Harry Taylor, the gage readings taken by William McComb, the fort keeper, at 9 a. m. each day are reported weekly to the United States Geological Survey. The conditions at this station and the bench marks are described in Water-Supply Paper No. 170, page 98, where are given also references to publications that contain data for previous years.

ily gage height, in feet, of Richelieu River at Fort Montgomery, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.05	3.55	3.0	3.1	4.7	4.3	3.5	2.5	1.5	1.1	0.7	1.5
.....	2.2	3.4	3.05	3.15	4.75	4.25	3.65	2.5	1.6	1.15	.8	1.5
.....	2.15	3.5	3.0	3.2	4.7	4.2	3.4	2.5	1.5	1.1	.9	1.5
.....	2.3	3.7	3.0	3.2	4.75	4.1	3.45	2.55	1.45	1.1	.8	1.4
.....	2.25	3.35	3.05	3.15	4.65	4.05	3.4	2.5	1.6	1.1	.75	1.4
.....	2.3	3.3	3.15	3.2	4.6	4.1	3.4	2.45	1.75	1.35	.8	1.4
.....	2.25	3.25	3.2	3.25	4.5	4.0	3.35	2.3	1.6	1.0	.7	1.45
.....	2.2	3.3	3.1	3.3	4.5	4.15	3.3	2.25	1.5	1.05	.75	1.5
.....	2.25	3.15	3.05	3.4	4.65	4.1	3.4	2.25	1.55	1.5	.7	1.5
.....	2.3	3.2	3.05	3.4	4.5	4.15	3.25	2.4	1.5	.9	.75	1.5
.....	2.25	3.2	3.05	3.45	4.4	4.05	3.2	2.6	1.55	.9	.8	1.5
.....	2.2	3.15	3.0	3.5	4.7	4.1	3.2	2.4	1.65	.8	.7	1.5
.....	2.1	3.05	3.05	3.55	4.65	4.05	3.3	2.3	1.8	1.0	.75	1.55
.....	2.15	3.0	2.95	4.1	4.55	4.1	3.15	2.05	1.45	.9	.8	1.5
.....	2.2	3.0	2.9	3.9	4.65	4.0	3.25	1.95	1.3	.9	.8	1.6
.....	2.4	3.1	2.85	3.8	4.7	4.1	3.2	2.0	1.45	.75	.8	1.45
.....	2.1	3.05	2.85	4.0	4.65	4.1	3.0	2.15	1.5	.85	.85	1.5
.....	2.2	3.1	2.75	4.25	4.7	3.95	3.0	2.0	1.4	.8	1.05	1.4
.....	2.1	3.0	2.8	4.3	4.55	3.85	3.05	2.0	1.3	1.0	.95	1.45
.....	2.4	3.1	2.7	4.45	4.5	3.75	3.15	1.95	1.3	.75	1.1	1.45
.....	2.25	3.15	2.8	4.6	4.4	3.75	3.0	1.9	1.2	.75	1.15	1.4
.....	2.3	3.0	2.65	4.7	4.4	3.65	2.95	1.8	1.2	.8	1.2	1.5
.....	2.45	3.05	2.55	4.75	4.4	3.6	2.8	1.7	1.15	.9	1.2	1.5
.....	2.95	3.2	2.52	4.75	4.3	3.6	2.75	1.65	1.1	.9	1.2	1.5
.....	3.2	3.1	2.5	4.85	4.35	3.65	2.6	1.9	1.2	.85	1.35	1.45
.....	3.5	3.05	2.55	4.9	4.45	3.75	2.75	1.85	1.4	.9	1.4	1.45
.....	3.6	3.05	2.7	4.8	4.35	3.7	2.7	1.8	1.05	1.15	1.3	1.5
.....	3.5	3.0	2.55	4.85	4.25	3.6	2.6	1.6	1.1	1.2	1.15	1.55
.....	3.55	.....	2.75	4.9	4.3	3.7	2.75	1.5	1.4	.9	1.4	1.6
.....	3.7	.....	2.95	4.85	4.3	3.65	2.8	1.55	1.05	.85	1.6	1.6
.....	3.5	.....	3.0	.....	4.4	.....	2.5	1.45	.....	.7	.....	1.65

'E.—The following ice conditions prevailed during 1906: December 6, 1905, to January 15, 1906, losed; ice from 0.5 to 1.0 foot thick. January 20 to February 2, lake open. February 3, lake over, no ice in channel near gage; ice about 0.3 foot thick above gage near breakwater. Feb- 14, ice 0.65 foot thick below gage and 0.35 foot thick above gage. March 15, channel open below ice 0.35 foot thick above gage. March 31, ice all out below breakwater.

Rating table for Richelieu River at Fort Montgomery, N. Y., for 1906.

Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.	Gage height.	Dis-charge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.70	5,680	1.70	9,080	2.70	12,520	3.70	16,290
0.80	6,020	1.80	9,420	2.80	12,880	3.80	16,640
0.90	6,360	1.90	9,760	2.90	13,240	3.90	17,020
1.00	6,700	2.00	10,100	3.00	13,600	4.00	17,400
1.10	7,040	2.10	10,440	3.10	13,980	4.20	18,240
1.20	7,380	2.20	10,780	3.20	14,360	4.40	19,080
1.30	7,720	2.30	11,120	3.30	14,740	4.60	19,940
1.40	8,060	2.40	11,460	3.40	15,120	4.80	20,820
1.50	8,400	2.50	11,800	3.50	15,500	5.00	21,700
1.60	8,740	2.60	12,160	3.60	15,880		

TE.—The above table is based on discharge measurements made at Chambly dam in 1898 by the d States Board on Deep Waterways.

Monthly discharge of Richelieu River at Fort Montgomery, N. Y., for 1906.

[Drainage area, 7,750 square miles.]

Month.	Discharge in second-feet.			Run-off.
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth inch
January	16,300	10,300	12,000	1.55	
February	16,300	13,600	14,300	1.85	
March	14,400	11,800	13,200	1.70	
April	21,300	14,000	17,500	2.26	
May	20,600	18,700	19,600	2.53	
June	18,700	15,900	17,200	2.22	
July	16,100	11,800	14,000	1.81	
August	12,200	8,230	10,400	1.34	
September	9,420	6,870	8,070	1.04	
October	8,400	5,680	6,580	.849	
November	8,740	5,680	6,650	.858	
December	8,910	8,060	8,370	1.08	
The year	21,300	5,680	12,300	1.59	

NOTE.—Discharge not affected by ice conditions on the lake.

SARANAC RIVER NEAR PLATTSBURG, N. Y.

A gaging station was established at the dam of the Plattsb Electric Light and Power Company, 6 miles above Plattsbu March 17, 1903. The conditions at this station and the bench ma are described in Water-Supply Paper No. 170, page 102, where given also references to publications that contain data for previ years.

Daily discharge, in second-feet, of Saranac River near Plattsburg, N. Y., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	D
1	763	994	551	1,100	512	966	1,020	610	381	181	722	
2	660	828	595	946	775	1,050	1,140	501	72	312	581	
3	603	742	524	723	488	708	964	477	162	337	550	
4	718	538	1,100	980	889	1,060	950	509	310	412	206	
5	770	528	1,300	1,100	1,130	688	994	585	385	330	222	
6	796	513	977	1,100	1,350	749	958	831	373	242	363	
7	751	496	781	961	1,120	893	806	520	447	80	390	
8	547	554	654	842	877	739	800	599	338	336	537	
9	582	539	613	782	882	1,020	1,160	484	106	617	384	
10	518	624	639	811	785	861	1,000	390	491	471	394	
11	518	714	546	799	754	1,040	1,210	319	447	434	70	
12	a 408	760	416	663	769	980	835	a 338	305	417	479	
13	299	671	510	738	1,350	1,020	513	356	335	478	346	
14	554	660	532	1,130	2,120	898	445	399	426	136	307	
15	403	554	502	1,880	2,090	863	278	539	291	400	286	
16	717	539	363	1,710	1,820	844	316	476	52	417	408	
17	572	562	321	1,550	1,520	762	333	438	224	491	487	
18	496	695	329	1,790	1,600	945	506	330	395	437	109	
19	469	678	376	1,500	1,260	795	202	a 489	419	382	843	
20	497	479	348	1,270	1,100	609	314	648	381	364	564	
21	748	940	374	1,340	984	704	421	296	404	42	868	
22	1,770	1,510	318	1,000	930	1,000	a 425	365	415	246	757	
23	2,260	1,130	372	1,110	694	1,160	430	276	128	398	870	
24	2,940	1,050	368	1,040	928	587	580	338	185	476	742	
25	2,370	1,200	419	731	1,280	647	493	339	411	597	321	
26	1,820	1,610	534	576	1,250	376	514	a 332	372	680	848	
27	1,700	1,030	878	740	1,250	613	638	a 332	265	628	648	
28	1,880	602	1,640	710	1,080	502	656	324	309	328	734	
29	1,430	.....	1,450	674	1,110	482	170	338	287	557	906	
30	1,450	.....	1,450	614	1,020	540	514	309	210	556	465	
31	1,010	.....	1,530	.....	1,000	.....	544	325	.....	637	.....	

a Discharge interpolated.

NOTE. During January, February, March, and December the dam is slightly obstructed by ice and discharges are liable to error.

Monthly discharge of Saranac River near Plattsburg, N. Y., for 1906.

[Drainage area, 624 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	2,940	299	991	1.59	1.83
y.....	1,610	513	776	1.24	1.29
.....	1,640	318	687	1.10	1.27
.....	1,790	576	1,030	1.65	1.84
.....	2,090	488	1,120	1.79	2.06
.....	1,160	376	803	1.29	1.44
.....	1,210	170	649	1.04	1.20
.....	831	276	436	.699	.81
er.....	491	52	311	.498	.57
.....	680	42	401	.643	.74
er.....	906	70	516	.827	.92
er.....	809	156	431	.691	.80
he year.....	2,940	42	679	1.09	14.76

.—Values are rated as follows: January to March and December, good; April to November, t.

OTTER CREEK AT MIDDLEBURY, VT.

is station was established April 1, 1903, by H. K. Barrows. It ated at the railway bridge about one-half mile south of the rail- station at Middlebury, Vt. The conditions at this station and ench marks are described in Water-Supply Paper No. 170, page where are given also references to publications that contain data revious years.

Discharge measurements of Otter Creek at Middlebury, Vt., in 1905-6.

te.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
05.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
9a.....	Butterfield and Brett.....	120	597	15.65	3,760
s.....	A. D. Butterfield.....	120	711	16.72	4,900
s.....	.....do.....	120	768	17.22	5,560
1c.....	.....do.....	120	581	15.52	3,750
1b.....	.....do.....	189	1,520	15.70	3,430
.....	Butterfield and Brett.....	120	367	13.40	1,370
s.....	G. M. Brett.....	118	334	12.90	946
06.					
10c.....	H. K. Barrows.....	106	352	13.40	1,160
l.....	G. M. Brett.....	133	465	14.25	2,100
ber 26...	A. D. Butterfield.....	117	229	12.35	316
ber 8...	.....do.....	117	229	12.27	344

m arch bridge.
m railroad bridge.
er frozen at gage, but open 500 feet below gage for some 800 feet to arch bridge and dam. Gage to bottom of ice, 12.77 feet; average thickness of ice, 0.70 foot.

Daily gage height, in feet, of Otter Creek at Middlebury, Vt., for 1906.

ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	.....	13.4	.....	15.6	14.0	15.45	13.95	13.2	12.6	12.2	12.5	12.85
.....	.....	13.2	13.2	15.5	13.75	15.5	14.2	12.8	12.45	12.8	12.6	12.8
.....	.....	.....	.....	15.15	14.0	15.55	13.8	12.6	12.35	12.[illegible]	12.5	12.55
.....	.....	.....	.....	14.75	14.45	15.3	13.4	12.5	12.7	12.3	12.5	.....
.....	.....	.....	.....	14.45	14.5	14.9	13.6	12.65	12.6	12.2	12.35	.....
.....	13.4	.....	.....	14.6	14.4	14.25	13.4	12.9	12.5	12.15	12.4	.....
.....	.....	13.2	.....	14.5	14.1	13.9	13.1	13.15	12.4	12.1	12.4	.....
.....	.....	.....	.....	14.2	13.8	14.1	12.85	13.0	12.4	12.0	12.35	.....
.....	.....	.....	.....	13.9	13.5	14.5	12.7	12.75	12.4	12.1	12.3	.....
.....	.....	.....	13.45	13.7	14.15	14.5	12.8	12.55	12.1	12.2	12.3	.....

Daily gage height, in feet, of Otter Creek at Middlebury, Vt., for 1906—Continu

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
11				13.7	14.4	14.45	13.0	12.5	12.25	12.2	12.3
12				13.9	14.35	14.2	12.85	12.6	12.3	12.35	12.3
13	12.8	12.5		13.95	14.3	13.7	12.7	12.5	12.3	12.4	12.6
14				14.25	14.5	13.2	12.6	12.5	12.4	12.6	12.6
15				15.3	14.55	12.95	12.5	12.4	12.4	12.1	12.55
16			12.4	15.5	14.3	12.9	12.4	12.4	12.3	12.3	12.5
17				15.5	14.05	13.0	12.4	12.4	12.0	12.3	12.4
18				15.7	13.8	13.7	12.45	12.4	12.15	12.25	12.45
19				15.95	13.6	13.7	12.4	12.25	12.3	12.15	13.6
20	12.8			16.3	13.25	13.3	12.4	12.0	12.3	12.05	14.3
21		12.4		16.4	13.1	13.0	12.4	12.5	12.2	13.0	14.2
22			12.3	16.45	12.95	12.9	12.4	12.5	12.2	13.0	13.85
23				16.35	12.8	12.85	12.9	12.45	12.3	12.85	13.6
24	15.5			16.25	12.8	13.2	12.9	12.5	12.2	12.5	13.3
25	15.25			16.15	12.85	13.5	12.7	12.5	12.3	12.5	13.15
26	15.25			15.9	13.1	13.4	12.5	12.6	12.35	12.7	12.9
27	15.55			15.65	13.5	13.1	12.4	13.05	12.3	12.9	13.25
28	15.25		14.7	15.3	14.6	12.85	12.4	14.7	12.2	12.75	13.5
29	14.7			14.9	14.9	12.7	12.7	13.6	12.2	12.6	13.45
30	14.4			14.5	15.1	12.9	13.4	13.2	12.3	12.6	13.1
31	13.7		15.7		15.3		13.6	12.8		12.6	

NOTE.—Creek was frozen January 1 to 24, February 3 to March 31, and December 3 to 31. D the frozen period gage heights were taken to water surface through a hole in the ice. The follo comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thi ne of i
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Fe*
January 6	13.4	13.45	0.3	March 10	13.45	13.5	
January 13	12.8	12.9	.6	March 16	12.4	12.45	
January 20	12.8	12.9	.5	March 22	12.3	12.4	
February 7	13.2	13.3	.5	March 28 [a]	14.7		
February 13	12.5	12.3	.5	December 13	12.35	12.35	
February 21	12.4	12.5	.9	December 19	12.5	12.6	
March 2	13.2	13.3	.7	December 26	12.3	12.45	

[a] Water flowing on top of ice.

Rating table for Otter Creek at Middlebury, Vt., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
12.00	220	13.10	1,030	14.20	2,080	15.60	3,610
12.10	275	13.20	1,120	14.30	2,180	15.80	3,830
12.20	335	13.30	1,210	14.40	2,290	16.00	4,070
12.30	400	13.40	1,300	14.50	2,400	16.20	4,310
12.40	470	13.50	1,390	14.60	2,510	16.40	4,550
12.50	540	13.60	1,480	14.70	2,620	16.60	4,790
12.60	615	13.70	1,580	14.80	2,730	16.80	5,030
12.70	695	13.80	1,680	14.90	2,840	17.00	5,270
12.80	775	13.90	1,780	15.00	2,950	17.20	5,510
12.90	860	14.00	1,880	15.20	3,170	17.40	5,750
13.00	945	14.10	1,980	15.40	3,390		

NOTE.—The above table is applicable only for open-channel conditions. It is based on disch measurements made during 1905–6, and is well defined between gage heights 13.0 feet and 18.0 feet. M monthly discharge computed from the above should be reasonably close, but daily discharges for g heights below 13.0 feet are liable to considerable error. Fluctuations caused by the dam below re variable the relation between gage height and the elevation of the water surface at the measu section.

Monthly discharge of Otter Creek at Middlebury, Vt., for 1905–6.

[Drainage area, 615 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
.....	5,630	1,210	2,950	4.80	5.36
.....	1,300	400	871	1.42	1.64
.....	2,400	335	1,210	1.97	2.20
.....	2,620	220	904	1.47	1.70
.....	2,730	305	951	1.55	1.79
.....	2,890	655	1,570	2.55	2.84
.....	860	400	590	.960	1.11
.....	1,430	400	625	1.02	1.14
.....	2,130	600	969	1.58	1.82
1906.					
.....	4,610	1,580	3,130	5.09	5.68
.....	3,280	775	1,870	3.04	3.50
.....	3,560	695	1,710	2.78	3.10
.....	2,080	470	881	1.43	1.65
.....	2,620	220	738	1.20	1.38
.....	695	220	421	.685	.76
.....	945	220	498	.810	.93
.....	2,180	400	869	1.41	1.57

alues are rated as follows: October to December, 1905, September and October, 1906, ıers, good.

WINOOSKI RIVER AT RICHMOND, VT.

ıtation was established June 25, 1903, by H. K. Barrows, at ıl highway bridge one-fourth mile south of the railway sta- Richmond, Vt. The conditions [a] at this station and the narks are described in Water-Supply Paper No. 170, page ıere are given also references to publications that contain r previous years.

Discharge measurements of Winooski River at Richmond, Vt., in 1906.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
....	H. K. Barrows	70	348	5.53	585
....	A. D. Butterfield	182	1,590	6.96	3,190
....	....do	182	1,470	6.57	3,500
....	Butterfield and Nye	183	1,960	9.55	9,180
....	A. D. Butterfield	180	1,430	6.50	3,380
....	G. M. Brett	180	1,430	6.50	3,210
....	Butterfield and Brett	180	1,130	4.97	1,240
....	....do	180	1,130	4.97	1,290
25..	A. D. Butterfield	145	180	3.92	389
30...	....do	178	1,110	5.10	1,350

of chain, 29.47 feet. Gage datum is at elevation 287.63 feet above mean sea level, as deter- ıg 1906 by connecting with the aluminum tablet bench mark of United States Geological Universalist church foundation.

ozen at gage; channel open 1,000 feet upstream and one-half mile downstream. Ice very ;en, and tilted, reaching to bottom for about two-thirds of section. Gage height is to water ;e height to bottom of ice about 3.4 feet; average thickness of ice about 2.8 feet.

Daily gage height, in feet, of Winooski River at Richmond, Vt., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov	Dec.
1	.....	5.4	.....	5.7	6.6	5.4	5.45	5.05	4.05	4.25	4.5	5.15
2	.....	5.45	5.9	5.4	6.15	5.25	5.1	4.45	3.85	4.05	4.4	5.5
3	.....	6.3	.....	5.3	6.9	5.3	4.75	4.25	5.55	4.1	4.3	5.4
4	.....	6.3	.....	5.5	6.7	5.1	4.9	4.15	6.25	3.8	4.3	6.5
5	5.95	6.3	.....	6.5	6.45	4.85	5.2	4.1	5.0	3.8	4.35	6.2
6	.....	5.9	.....	7.35	6.15	5.1	4.8	4.25	4.6	3.9	4.3	6.1
7	.....	6.25	.....	6.3	5.8	6.55	4.45	5.75	4.4	4.1	4.25	6.0
8	.....	5.9	.....	6.35	5.5	5.9	4.35	4.7	4.05	3.8	4.1	.....
9	.....	5.8	5.5	6.1	5.75	6.1	4.3	4.25	3.95	4.15	4.0	.....
10	.....	.....	.....	5.9	7.3	5.6	4.3	4.15	4.15	4.25	4.2	.....
11	.....	.....	.....	5.6	6.5	5.5	5.35	4.15	4.1	4.25	4.0	.....
12	5.5	.....	.....	6.6	6.05	5.2	4.85	3.75	3.85	4.75	4.6	.....
13	.....	.....	.....	6.7	10.2	4.95	4.5	3.85	3.85	4.7	4.6	.....
14	.....	.....	.....	7.8	8.4	4.8	4.3	3.95	3.95	4.6	4.4	5.9
15	.....	.....	.....	11.7	6.8	4.5	4.05	4.0	3.95	4.5	4.3	.....
16	.....	5.55	5.3	11.4	6.35	4.5	4.25	3.85	3.75	4.7	4.8	.....
17	.....	.....	.....	9.8	6.1	4.5	3.95	3.85	3.7	4.45	4.9	.....
18	.....	.....	.....	9.25	6.1	5.45	3.95	3.75	3.85	4.2	5.3	.....
19	5.4	.....	.....	9.15	5.75	5.05	4.3	3.55	4.15	4.15	7.95	.....
20	.....	.....	.....	9.35	5.35	4.7	4.05	3.45	3.85	5.5	6.55	.....
21	.....	.....	.....	9.5	5.15	4.5	4.65	3.95	3.85	5.7	5.8	5.7
22	.....	.....	.....	9.9	5.25	4.7	5.15	3.75	3.85	5.0	5.7	.....
23	11.2	8.55	5.4	8.1	4.95	5.35	4.55	3.75	3.75	4.7	5.8	.....
24	13.8	.....	.....	7.0	4.85	7.7	4.25	4.0	3.95	4.55	5.3	.....
25	7.75	.....	.....	6.4	5.85	6.4	4.05	3.95	3.95	4.8	4.9	.....
26	6.7	.....	.....	6.3	6.5	5.7	4.0	3.65	3.95	5.3	4.95	.....
27	6.35	.....	.....	6.1	7.25	5.2	4.15	4.15	4.15	4.9	5.7	.....
28	6.2	.....	7.6	6.05	8.15	4.8	3.95	7.9	4.0	4.6	6.15	5.7
29	5.6	.....	6.9	5.9	6.7	5.1	3.9	5.05	4.2	4.7	5.7	.....
30	5.5	.....	6.45	6.4	6.1	5.35	6.65	4.55	4.65	4.5	5.15	.....
31	5.5	.....	6.3	.....	5.65	.....	6.05	4.35	.....	4.4	.....	.....

NOTE.—River frozen January 1 to 22, February 7 to March 28, and December 4 to 31. During the frozen period gage heights were taken to water surface through a hole in the ice. The following comparative readings were taken:

Comparative ice and water readings.

Date.	Water surface.	Top of ice.	Thickness of ice.	Date.	Water surface.	Top of ice.	Thickness of ice.
	Feet.	*Feet.*	*Feet.*		*Feet.*	*Feet.*	*Feet.*
January 5[a]	5.95	5.7	1.1	December 7	6.0	6.15	0.9
January 12	5.5	5.65	1.3	December 14	5.9	6.1	1.4
January 19	5.4	5.55	1.4	December 21	5.7	5.95	1.5
March 9[b]	5.5	6.2	2.8	December 28	5.7	5.9	1.5

[a] Water on top of ice.
[b] During the period from about January 23 to March 28 gage heights give little or no indication of discharge owing to an ice jam at the bridge. See note to measurement made March 9, 1906.

Rating table for Winooski River at Richmond, Vt., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.40	215	4.80	1,060	6.20	2,830	8.20	6,350
3.50	235	4.90	1,165	6.30	2,980	8.40	6,750
3.60	260	5.00	1,275	6.40	3,140	8.60	7,160
3.70	290	5.10	1,385	6.50	3,300	8.80	7,580
3.80	330	5.20	1,500	6.60	3,460	9.00	8,000
3.90	380	5.30	1,615	6.70	3,620	9.20	8,420
4.00	435	5.40	1,735	6.80	3,790	9.40	8,840
4.10	495	5.50	1,860	6.90	3,960	9.60	9,270
4.20	560	5.60	1,985	7.00	4,130	9.80	9,710
4.30	630	5.70	2,115	7.20	4,470	10.00	10,150
4.40	705	5.80	2,250	7.40	4,830	11.00	12,400
4.50	785	5.90	2,390	7.60	5,190	12.00	14,700
4.60	870	6.00	2,530	7.80	5,570		
4.70	960	6.10	2,680	8.00	5,950		

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1906 and the form of previous curves. It is well defined between gage its 3.9 feet and 10.0 feet. An increase in discharge for a given gage height is taking place at this on from year to year. These yearly changes may be due to the scouring effect of ice jams.

Monthly discharge of Winooski River at Richmond, Vt., for 1906.

[Drainage area, 885 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	14,000	1,620	5,000	5.65	6.30
.....	10,600	1,110	3,230	3.65	4.21
.....	5,380	785	1,700	1.92	2.14
.....	3,540	380	964	1.09	1.26
t.....	5,760	225	753	.851	.98
ıber.....	2,900	290	615	.695	.78
ır.....	2,120	330	831	.939	1.08
ıber.....	5,860	435	1,390	1.57	1.75

:.—Values are rated as follows: April to June, good; July to November, fair.

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CLASSIFICATION OF THE PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY.

[Water-Supply Paper No. 206.]

The publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of United States—folios and separate sheets thereof, (8) Geologic Atlas of United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists can be had on application.

Most of the above publications can be obtained or consulted in the following ways:

1. A limited number are delivered to the Director of the Survey, from whom they can be obtained, free of charge (except classes 2, 7, and 8), on application.

2. A certain number are delivered to Senators and Representatives in Congress, for distribution.

3. Other copies are deposited with the Superintendent of Documents, Washington, D. C., from whom they can be had at practically cost.

4. Copies of all Government publications are furnished to the principal public libraries in the large cities throughout the United States, where they can be consulted by those interested.

The Professional Papers, Bulletins, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, hydrographic progress reports.

Series P.—The hydrographic progress reports contain the results of stream measurements. A report is issued for every calendar year, containing the results of data collected during that year. These reports were first published as a part of the Director's annual report or as a bulletin; they are now published as water-supply and irrigation papers. The following is a list, by years, of the publications containing the progress reports of stream measurements (* means out of stock). A detailed index of these reports (1888–1903) is published as Water-Supply Paper No. 119.

1888. Tenth Annual Report, Part II*.
1889. Eleventh Annual Report, Part II*.
1890. Twelfth Annual Report, Part II*.
1891. Thirteenth Annual Report, Part III*.
1892. Fourteenth Annual Report, Part II*.
1893. Bulletin No. 131*.
1894. Bulletin No. 131*; Sixteenth Annual Report, Part II*
1895. Bulletin No. 140*.
1896. Water-Supply Paper No. 11*; Eighteenth Annual Report, Part IV*.
1897. Water-Supply Papers Nos. 15* and 16*; Nineteenth Annual Report, Part IV*.
1898. Water-Supply Papers Nos. 27* and 28*; Twentieth Annual Report, Part IV*.
1899. Water-Supply Papers Nos. 35*, 36*, 37*, 38*, and 39*; Twenty-first Annual Report, Part IV*.
1900. Water-Supply Papers Nos. 47, 48, 49, 50, 51, and 52; Twenty-second Annual Report, Part IV.

1901. East of Mississippi River, Water-Supply Papers Nos. 65* and 75*.
West of Mississippi River, Water-Supply Papers Nos. 66 and 75*.
1902. East of Mississippi River, Water-Supply Papers Nos. 82 and 83.
West of Mississippi River, Water-Supply Papers Nos. 84 and 85.
1903. East of Mississippi River, Water-Supply Papers Nos. 97 and 98.
West of Mississippi River, Water-Supply Papers Nos. 99 and 100.
1904. East of Mississippi River, Water-Supply Papers Nos. 124, 125, 126, 127, 128, and 129.
West of Mississippi River, Water-Supply Papers Nos. 130, 131, 132, 133, 134, and 135.
1905. East of Mississippi River, Water-Supply Papers Nos. 165*, 166*, 167, 168*, 169, 170, and 171.
West of Mississippi River, Water-Supply Papers Nos. 171, 172*, 173*, 174, 175*, 176, 177, and 178.
1906. East of Mississippi River, Water-Supply Papers Nos. 201, 202, 203, 204, 205, 206, and 207.
West of Mississippi River, Water-Supply Papers Nos. 207, 208, 209, 210, 211, 212, 213, and 214.

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THE DIRECTOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C.

JULY, 1907.

O

Water-Supply and Irrigation Paper No. 207 Series P, Hydrographic Progress Reports, 61

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY
CHARLES D. WALCOTT, DIRECTOR

SURFACE WATER SUPPLY
OF
UPPER MISSISSIPPI RIVER AND HUDSON BAY DRAINAGES

1906

A. H. HORTON AND ROBERT FOLLANSBEE
DISTRICT HYDROGRAPHERS

WASHINGTON
GOVERNMENT PRINTING OFFICE
1907

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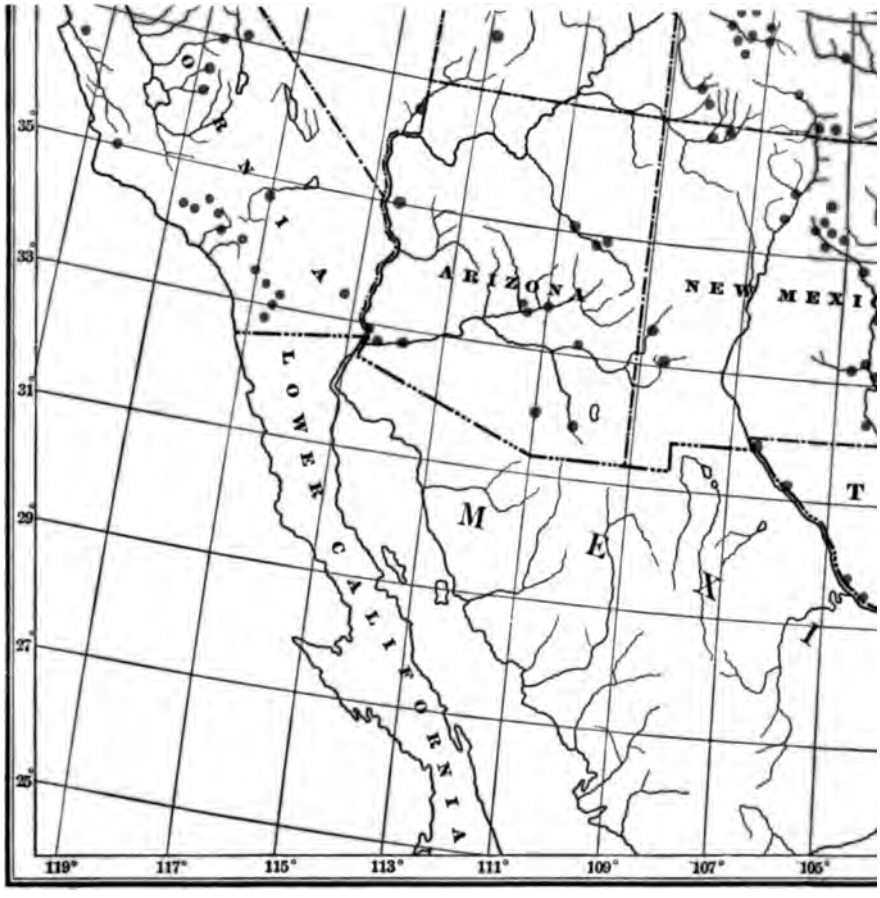


MAP OF UNITED STATES

ırface water supply of the Great Lakes and St. Lawrence River drainages, 1906.
ırface water supply of the upper Mississippi River and Hudson Bay drainage, 1906.
rface water supply of the Missouri River drainage, 1906.
rface water supply of the lower western Mississippi River drainage, 1906.
rface water supply of the western Gulf of Mexico and Rio Grande drainages, 1906.
rface water supply of the Colorado River drainage above Yuma, 1906.
rface water supply of the Great Basin drainage, 1906.
rface water supply of California, 1906. (The Great Basin and Pacific Ocean drainage in California, and Colorado River drainage below Yuma.)
rface water supply of the North Pacific Coast drainages, 1906.

records at most of the stations discussed in these reports l over a series of years. An index of the reports containing such s up to and including 1903 has been published in Water-Supply No. 119. The following table gives, by years and primary ,ge basins, the numbers of the papers on the surface water sup- ıblished from 1901 to 1906.

s of water-supply papers containing results of stream measurements, 1901-1906.[a]

	1901.	1902.	1903.	1904.	1905.	1906.
	No.	*No.*	*No.*	*No.*	*No.*	*No.*
Coast of New England drainage	65 75	82	97	124	165	201
Passaic, Raritan, and Delaware river ges	65 75	82	97	125	166	202
anna, Gunpowder, Patapsco, Potomac, Roanoke, and Yadkin river drainages	65 75	82 83	97 98	126	167	203
Savannah, Ogeechee, and Altamaha river stern Gulf of Mexico drainages	65 75	83	98	126	168	204
l lower eastern Mississippi river drainages	65 75	83	98	128	169	205
ıkes and St. Lawrence River drainages	65	83	97	129	170	206
Bay and upper eastern and western Missis- tiver drainages	65 66 75	83 84 85	98 99 100	128 130	171	207
River drainage	66 75	84	99	130 131	172	208
:, Arkansas, Red, and lower western Missis- iver drainages	66 75	84	99	131	173	209
Gulf of Mexico and Rio Grande drainages	66 75	84	99	132	174	210
› River drainage above Yuma	66 75	85	100	133	175	211
at Basin drainage	66 75	85	100	133	176	212
at Basin and Pacific Ocean drainages in Cali- , and Colorado River drainage below Yuma	66 75	85	100	134	177	213
'acific Coast drainages	66 75	85	100	135	178	214

DEFINITIONS.

› volume of water flowing in a stream—the "run-off" or "dis- e"—is expressed in various terms, each of which has become ated with a certain class of work. These terms may be divided wo groups—(1) those which represent a rate of flow, as second-gallons per minute, miner's inches, and run-off in second-feet

ırts containing data for years prior to 1901 are noted in the series list at the end of this paper.

per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches and acre-feet. They may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second and is the quantity of water flowing in a stream 1 foot wide, 1 foot deep, at a rate of 1 foot per second. It is generally used as a fundamental unit from which others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

The "miner's inch" is the quantity of water that passes through an orifice 1 inch square under a head which varies locally. It has been commonly used by miners and irrigators throughout the West and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. It is commonly used in connection with storage for irrigation work. There is a convenient relation between the second-foot and the acre-foot: One second-foot flowing for twenty-four hours will deliver 86,400 cubic feet, or approximately 2 acre-feet.

EXPLANATION AND USE OF TABLES.

For each regular gaging station are given, as far as available, the following data:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.
6. Tables showing discharge and horsepower and the number of days during the year when the same are available.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station, and they also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge

easurements made during the year, including the date, the name of ıe hydrographer, the width and area of cross section, the gage eight, and the discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the ırface of the river as found from the mean of the gage heights taken ıch day. The gage height given in the table represents the elevation the surface of the water above the zero of the gage. At most stations ıe gage is read in the morning and in the evening.

The discharge measurements and gage heights are the base data om which the other tables are computed. In cases of extensive evelopment, it is expected that engineers will use these original data ı making their calculations, as the computations made by the Surey are based on the data available at the time they are made and ıould be reviewed and, if necessary, revised when additional data are vailable.

The rating table gives the discharge in second-feet, corresponding to arious stages of the river, as given by the gage heights. It is published to enable engineers to determine the daily discharge in case this formation is desired.

In the table of monthly discharge the column headed "Maximum" ives the mean flow for the day when the mean gage height was highst, and it is the flow as given in the rating table for that mean gage eight. As the gage height is the mean for the day, there might have een short periods when the water was higher and the corresponding ischarge larger than given in this column. Likewise, in the column f "Minimum" the quantity given is the mean flow for the day when he mean gage height was lowest. The column headed "Mean" is he average flow for each second during the month. Upon this he computations for the remaining columns, which are defined on age 4, are based.

The values in the table of monthly discharge are intended to give nly a general idea of the conditions of flow at the station, and it is ıot expected that they will be used for other than preliminary stimates.

In most work where data in regard to flow are used the regimen flow is of primary importance. Therefore for the principal staons tables have been prepared showing the horsepower that can be eveloped at various rates of flow and the length of time that these ıtes of flow and the corresponding horsepower are available. These ıbles have been prepared on a basis of 80 per cent efficiency on the ırbines, and the horsepower per foot of fall is given in order that the ıader can determine the horsepower for any fall.

In the computations sufficient significant figures have been used ı that the percentage of error in the tables will not in general exceed per cent. Therefore most of the values in the tables are given to

only three significant figures. In making the various computat Thatcher's slide rule, Crelle's tables, and computation machines h been generally used.

In order to give engineers an idea of the relative value of various data, notes in regard to accuracy are given as far as possi This accuracy depends on the general local conditions at the gag stations and the amount of data collected. Every effort possibl made to so locate the stations that the data collected will give a h degree of accuracy. This is not always possible, but it is conside better to publish rough values with explanatory notes rather thar data.

In the accuracy notes the following terms have been used, indi ing the probable accuracy in per cent of the mean monthly flow. these values are mean values, the error in the value for the flo any individual day may be much larger.

Excellent indicates that the mean monthly flow is prob accurate to within 5 per cent; good, to within 10 per cent; fai within 15 per cent; approximate, to within 25 per cent.

CONVENIENT EQUIVALENTS.

Following is a table of convenient equivalents for use in hydr computations:

1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 ga per minute; equals 646,272 gallons for one day.
1 second-foot equals 6.23 British imperial gallons per second.
1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot quals about 1 acre-inch per hour.
1 second-foot for one day covers 1 square mile 0.03719 inch deep.
1 second-foot for one 28-day month covers 1 square mile 1.041 inches deep.
1 second-foot for one 29-day month covers 1 square mile 1.079 inches deep.
1 second-foot for one 30-day month covers 1 square mile 1.116 inches deep.
1 second-foot for one 31-day month covers 1 square mile 1.153 inches deep.
1 second-foot for one day equals 1.983 acre-feet.
1 second-foot for one 28-day month equals 55.54 acre-feet.
1 second-foot for one 29-day month equals 57.52 acre-feet.
1 second-foot for one 30-day month equals 59.50 acre-feet.
1 second-foot for one 31-day month equals 61.49 acre-feet.
100 California miner's inches equal 15.7 United States gallons per second
100 California miner's inches equal 96.0 Colorado miner's inches.
100 California miner's inches for one day equal 4.96 acre-feet.
100 Colorado miner's inches equal 2.60 second-feet.
100 Colorado miner's inches equal 19.5 United States gallons per second.
100 Colorado miner's inches equal 104 California miner's inches.
100 Colorado miner's inches for one day equal 5.17 acre-feet.

100 United States gallons per minute equal 0.223 second-foot.
100 United States gallons per minute for one day equal 0.442 acre-foot.
1,000,000 United States gallons per day equal 1.55 second-feet.
1,000,000 United States gallons equal 3.07 acre-feet.
1,000,000 cubic feet equal 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot equals 7.48 gallons.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equal about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel, realizing 80 per cent of theoretical power.

FIELD METHODS OF MEASURING STREAM FLOW.

The methods used in collecting these data and in preparing them for publication are given in detail in Water-Supply Papers No. 94 (Hydrographic Manual, U. S. Geological Survey) and No. 95 (Accuracy of Stream Measurements). In order that those who use this report may readily become acquainted with the general methods employed, the following brief descriptions are given:

Streams may be divided, with respect to their physical conditions, into three classes—(1) those with permanent beds; (2) those with beds which change only during extreme low or high water; (3) those with constantly shifting beds. In determining the daily flow special methods are necessary for each class. The data upon which these determinations are based and the methods of collecting them are, however, in general the same.

There are three distinct methods of determining the flow of open-channel streams—(1) by measurements of slope and cross section and the use of Chezy's and Kutter's formulas; (2) by means of a weir; (3) by measurements of the velocity of the current and the area of the cross section. The method chosen for any case depends upon the local physical conditions, the degree of accuracy desired, the funds available, and the length of time that the record is to be continued.

Slope method.—Much information has been collected relative to the coefficients to be used in the Chezy formula, $v = c\sqrt{Rs}$. This has been utilized by Kutter, both in developing his formula for c and in determining the values of the coefficient n which appears therein. The results obtained by the slope method are, in general, only roughly approximate, owing to the difficulty in obtaining accurate data and the uncertainty of the value for n to be used in Kutter's formula. The most common use of this method is in determining the flood discharge of a stream when the only data available are the cross section, the slope as shown by marks along the bank, and a knowledge of the general conditions.

Weir methods.—When funds are available and the conditions are such that sharp-crested weirs can be erected, these offer the best facilities for determining the flow. If dams are suitably situated and constructed, they may be utilized for obtaining reliable measurements of flow. The conditions necessary to insure good results may be divided into two classes—(1) those relating to the physical characteristics of the dam itself and (2) those relating to the diversion and use of water around and through the dam.

The physical requirements are as follows: (*a*) Sufficient height of dam, so that backwater will not interfere with free fall over it; (*b*) absence of leaks of appreciable magnitude; (*c*) topography or abutments which confine the flow over the dam at high stages; (*d*) level crests, which are kept free from obstructions caused by floating logs or ice; (*e*) crests of a type for which the coefficients to be used in $Q = c\,b\,h^{\frac{3}{2}}$, or some similar standard weir formula are known (see Water-Supply Papers Nos. 180 and 200[a]); (*f*) either no flash boards or exceptional care in reducing leakage through them and in recording their condition.

Preferably there should be no diversion of water through or around the dam. Generally, however, the dam is built for purposes of power or navigation and part or all of the water flowing past it is diverted for such uses. This water is measured and added to that passing over the dam. To insure accuracy in such determinations of flow the amount of water diverted should be reasonably constant. Furthermore, it should be so diverted that it can be measured, either by a weir, a current meter, or a simple system of water wheels which are of standard make, or which have been rated as meters under working conditions, and so installed that the gate openings, the heads under which they work, and their angular velocities may be accurately observed.

The combination of physical conditions and uses of the water should be such that the determinations of flow will not involve, for a critical stage of considerable duration, the use of a head, on a broad-

[a] Water-Supply Paper No. 200 replaces No. 150, the edition of which has been exhausted.

sted dam, of less than 6 inches. Moreover, when all other condi-
ns are good, the cooperation of the owners or operators of the plant
still essential if reliable results are to be obtained.

A gaging station at a weir or dam has the general advantage of con-
uity of record through the period of ice and floods and the disad-
ntages of uncertainty of coefficient to be used in the weir formula
d of complications in the diversion and use of the water.

Velocity method.—The determination of the quantity of water flow-
g past a certain section of a stream at a given time is termed a
scharge measurement. This quantity is the product of two fac-
rs—the mean velocity and the area of the cross section. The
ean velocity is a function of surface slope, wetted perimeter, rough-
ss of bed, and the channel conditions at, above, and below the
ging section. The area depends upon the contour of the bed and
e fluctuations of the water surface. The two principal ways of
easuring the velocity of a stream are by floats and current meters.
Great care is taken in the selection and equipment of gaging sta-
ons for determining discharge by velocity measurements in order
at the data may have the required degree of accuracy. Their
sential requirements are practically the same whether the velocity
determined by meters or floats. They are located as far as possi-
e where the channel is straight both above and below the gaging
ction; where there are no cross currents, backwater, or boils; where
e bed of the stream is reasonably free from large projections of a
rmanent character; and where the banks are high and subject to
erflow only at flood stages. The station must be so far removed
om the effects of tributary streams and of dams or other artificial
structions that the gage height shall be an index of the discharge.
Certain permanent or semipermanent structures usually referred
as equipment are generally pertinent to a gaging station. These
e a gage for determining the fluctuations of the water surface,
nch marks to which the datum of the gage is referred, permanent
arks on a bridge or a tagged line indicating the points of measure-
ent, and, where the current is swift, some appliance (generally a
condary cable) to hold the meter in position in the water. As a
le, the stations are located at bridges if the channel conditions are
tisfactory, as from them the observations can more readily be made
d the cost of the equipment is small.

The floats in common use are the surface, subsurface, and tube or
d floats. A corked bottle with a flag in the top and weighted at
e bottom makes one of the most satisfactory surface floats, as it
affected but little by wind. In case of flood measurements, good
sults can be obtained by observing the velocity of floating cakes of
or débris. In case of all surface-float measurements, coefficients
ust be used to reduce the observed velocity to the mean velocity.

The subsurface and tube or rod floats are intended to give directly the mean velocity in the vertical. Tubes give excellent results when the channel conditions are good, as in canals.

In measuring velocity by a float, observation is made of the time taken by the float to pass over the "run," a selected stretch of river from 50 to 200 feet long. In each discharge measurement a large number of velocity determinations are made at different points across the stream, and from these observations the mean velocity for the whole section is determined. This may be done by plotting the mean positions of the floats as indicated by the distances from the bank as ordinates and the corresponding times as abscissas. A curve through these points shows the mean time of run at any point across the stream, and the mean time for the whole stream is obtained by dividing the area bounded by this curve and its axis by the width. The length of the run divided by the mean time gives the mean velocity.

The area used in float measurements is the mean of the areas at the two ends of the run and at several intermediate sections.

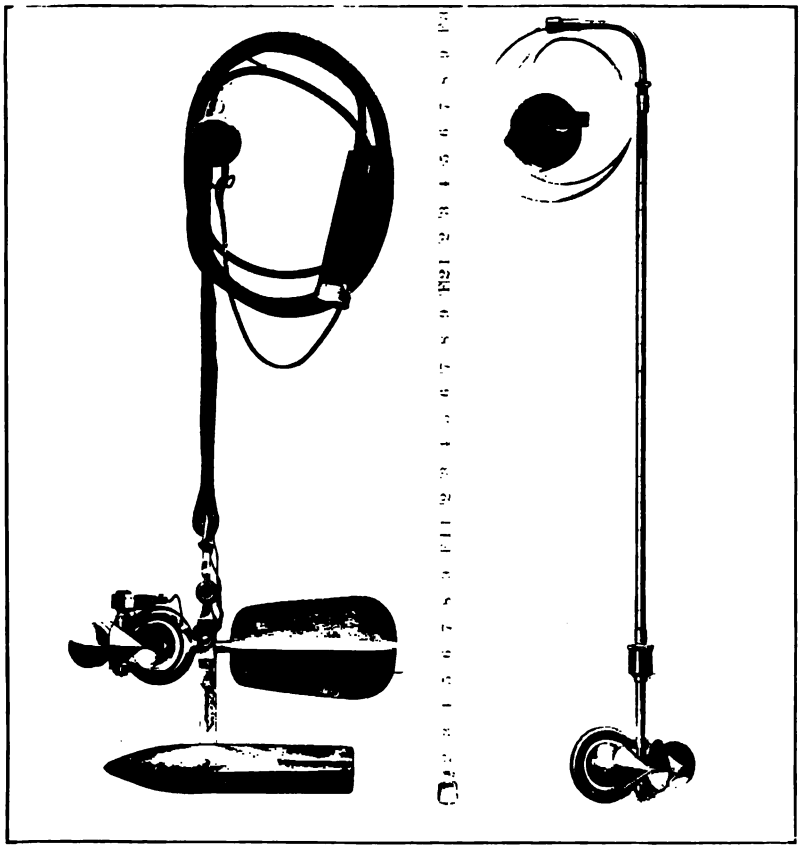
The essential parts of the current meters in use are a wheel of some type, so constructed that the impact of flowing water causes it to revolve, and a device for recording or indicating the number of revolutions. The relation between the velocity of the moving water and the revolutions of the wheel is determined for each meter. This rating is done by drawing the meter through still water for a given distance at different speeds and noting the number of revolutions for each run. From these data a rating table is prepared which gives the velocity per second for any number of revolutions.

Many kinds of current meters have been constructed. They may, however, be classed in two general types: Those in which the wheel is made up of a series of cups, as the Price, and those having a screw propeller wheel, as the Haskell. Each meter has been developed for use under some special condition. In the case of the small Price meter, shown in Pl. II, *B*, which has been largely developed and has been extensively used by the United States Geological Survey, an attempt has been made to get an instrument which could be used under practically all conditions.

Current-meter measurements may be made from a bridge, a cable, a boat, or by wading, and gaging stations may be classified in accordance with such use. Fig. 1 shows a typical cable station.

In making the measurement an arbitrary number of points are laid off on a line perpendicular to the thread of the stream. The points at which the velocity and depth are observed are known as measuring points, and are usually fixed at regular intervals, varying from 2 to 20 feet, depending upon the size and condition of the stream. Perpendiculars dropped from the measuring points divide the gaging section into strips. For each strip or pair of strips the mean velocity

A. CURRENT-METER RATING STATION AT LOS ANGELES, CAL.



B. PRICE CURRENT METERS.

ea, and discharge are determined independently, so that conditions isting in one part of the stream may not be extended to parts where ey do not apply.

Three classes of methods of measuring velocity with current meters e in general use—multiple-point, single-point, and integration.

The three principal multiple-point methods in general use are the rtical velocity-curve; 0.2 and 0.8 depth; and top, bottom, and id-depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually from 5 to 1 foot apart. By plotting these velocities as abscissas and eir depths as ordinates, and drawing a smooth curve among the sulting points, the vertical velocity-curve is developed. This curve ows graphically the magnitude and changes in velocity from the rface to the bottom of the stream. The mean velocity in the ertical is then obtained by dividing the area bounded by this elocity-curve and its axis by the depth. On account of the length

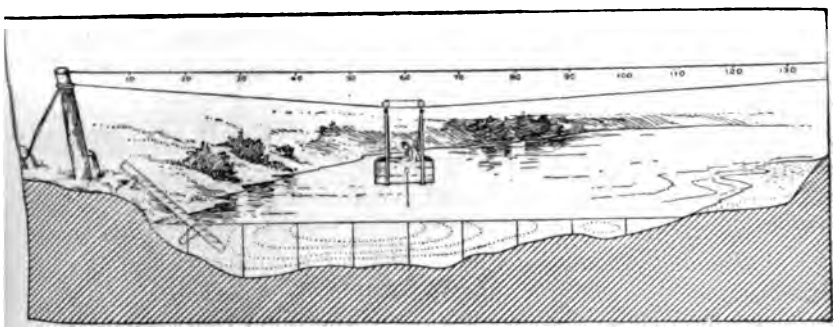


FIG. 1.—Cable station, showing section of river, car, gage, etc.

of time required to make a complete measurement by this method, its ise is limited to the determination of coefficients for purposes of comparison and to measurements under ice.

In the second multiple-point method the meter is held successively t 0.2 and 0.8 of the depth, and the mean of the velocities at these two oints is taken as the mean velocity for that vertical. On the assumption that the vertical velocity-curve is a common parabola with orizontal axis, the mean of the velocities at 0.22 and 0.79 of the epth will give (closely) the mean velocity in the vertical. Actual bservations under a wide range of conditions show that this second nultiple-point method gives the mean velocity very closely for open-ater conditions and, moreover, the indications are that it holds early as well for ice-covered rivers.

In the third multiple-point method the meter is held at mid-depth, t 0.5 foot below the surface, and at 0.5 foot above the bottom, and he mean velocity is determined by dividing by 6 the sum of the top

velocity, four times the mid-depth velocity, and the bottom velocity. This method may be modified by observing at 0.2, 0.6, and 0.8 depth.

The single-point method consists in holding the meter either at the depth of the thread of mean velocity or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined.

Extensive experiments by vertical velocity-curves show that the thread of mean velocity generally occurs at from 0.5 to 0.7 of the total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, at which point the meter is held in a majority of the measurements. A large number of vertical velocity-curve measurements taken on many streams and under varying conditions show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of the wind or other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be from 0.85 to 0.95, depending upon the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is especially adapted for flood measurements, or when the velocity is so great that the meter can not be kept at 0.6 depth.

The vertical-integration method consists in moving the meter at a slow, uniform speed from the surface to the bottom and back again to the surface, and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods.

The area, which is the other factor in the velocity method of determining the discharge of a stream, depends on the stage of the river, which is observed on the gage, and on the general contour of the bed of the stream, which is determined by soundings. The soundings are usually taken at each measuring point at the time of the discharge measurement, either by using the meter and cable or by a special sounding line or rod. For streams with permanent beds standard cross sections are usually taken during low water. These sections serve to check the soundings which are taken at the time of the measurements, and from them any change which may have taken place in the bed of the stream can be detected. They are also of value in obtaining the area for use in computations of high-water measurements, as accurate soundings are hard to obtain at high stages.

In computing the discharge measurements from the observed velocities and depths at various points of measurement, the measuring section is divided into elementary strips, as shown in fig. 1, and the

ean velocity, area, and discharge are determined separately for :her a single or a double strip. The total discharge and the area are e sums of those for the various strips, and the mean velocity is tained by dividing the total discharge by the total area.

The determination of the flow of an ice-covered stream is difficult, ing to diversity and instability of conditions during the winter riod, and also to lack of definite information in regard to the laws flow of water under ice. The method now employed is to make quent discharge measurements during the frozen periods by the 2 and 0.8, and vertical velocity-curve methods, and to keep an curate record of the conditions, such as the gage height to the surce of the water as it rises in a hole cut in the ice, the thickness and aracter of the ice, etc. From these data an approximate estimate the daily flow can be made by constructing a rating curve (really series of curves) similar to that used for open channels, but condering, in addition to gage heights and discharge, the varying thickss of ice. For information in regard to flow under ice cover, see 'ater-Supply Paper No. 187.

OFFICE METHODS OF COMPUTING RUN-OFF.

There are two principal methods of determining run-off, depending on whether or not the bed of the stream is permanent.

For stations on streams with permanent beds, the first step in comting the run-off is the construction of a rating table, which shows discharge corresponding to any stage of the stream. This rating le is applied to the record of stage to determine the amount of ter flowing. The construction of the rating table depends upon method used in measuring flow.

For a station at a weir or dam, the basis for the rating table is some ndard weir formula. The coefficients to be used in its application pend upon the type of dam and other conditions near its crest. ter inserting in the weir formula the measured length of crest and umed coefficient, the discharge is computed for various heads and rating table constructed.

The data necessary for the construction of a rating table for a locity-area station are the results of the discharge measurements, ich include the record of stage of the river at the time of measureent, the area of the cross section, the mean velocity of the current, d the quantity of water flowing. A thorough knowledge of the nditions at and in the vicinity of the station is also necessary.

The construction of the rating table depends upon the following ws of flow for open, permanent channels: (1) The discharge will main constant so long as conditions at or near the gaging station main constant; (2) the discharge will be the same whenever the eam is at a given stage if the change of slope due to the rise and fall

of the stream be neglected; (3) the discharge is a function of and increases gradually with the stage.

The plotting of results of the various discharge measurements using gage heights as ordinates, and discharge, mean velocity, and area as abscissas, will define curves which show the discharge, mean velocity, and area corresponding to any gage height. For the development of these curves there should be therefore a sufficient number of discharge measurements to cover the range of the stage of the stream. Fig. 2 shows a typical rating curve with its corresponding mean-velocity and area curves.

As the discharge is the product of two factors—the area and the mean velocity—any change in either factor will produce a corresponding change in the discharge. Their curves are therefore constructed in order to study each independently of the other.

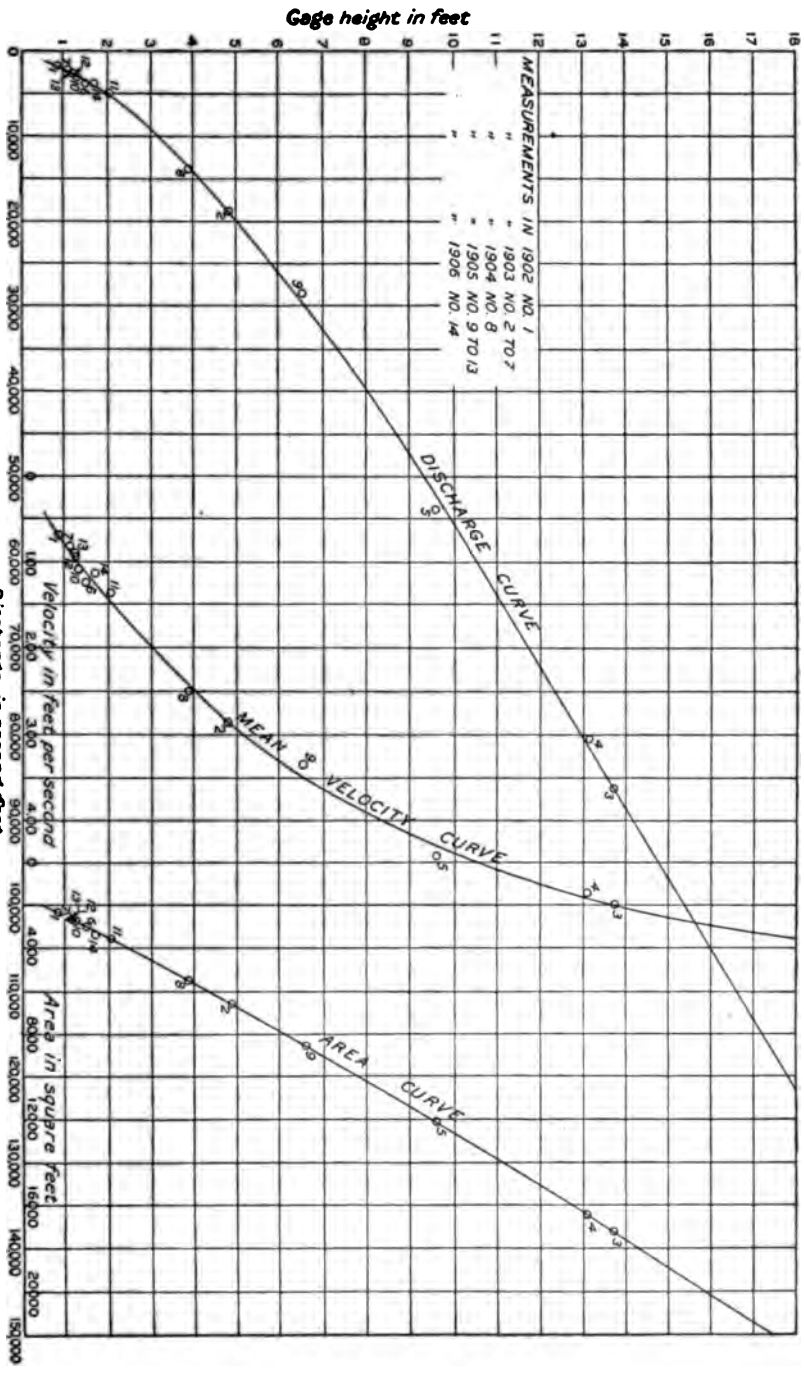
The area curve can be definitely determined from accurate soundings extending to the limits of high water. It is always concave toward the horizontal axis or on a straight line, unless the banks of the stream are overhanging.

The form of the mean-velocity curve depends chiefly upon the surface slope, the roughness of the bed, and the cross section of the stream. Of these the slope is the principal factor. In accordance with the relative changes of these factors the curve may be either a straight line, convex or concave toward either axis, or a combination of the three. From a careful study of the conditions at any gaging station the form which the vertical velocity-curve will take can be predicted, and it may be extended with reasonable certainty to stages beyond the limits of actual measurements. Its principal use is in connection with the area curve in locating errors in discharge measurements and in constructing the rating table.

The discharge curve is defined primarily by the measurements of discharge, which are studied and weighted in accordance with the local conditions existing at the time of each measurement. The curve may, however, best be located between and beyond the measurements by means of curves of area and mean velocity. The discharge curve under normal conditions is concave toward the horizontal axis and is generally parabolic in form.

In the preparation of the rating table the discharge for each tenth or half tenth on the gage is taken from the curve. The differences between successive discharges are then taken and adjusted according to the law that they shall either be constant or increasing.

The determination of daily discharge of streams with changeable beds is a difficult problem. In case there is a weir or dam available, a condition which seldom exists on streams of this class, the discharge can be determined by its use. In case of velocity-area stations frequent discharge measurements must be made if the deter


Gage height in feet
MEASUREMENTS IN 1902 NO. 1
" 1903 NO. 2 TO 7
" 1904 NO. 8
" 1905 NO. 9 TO 13
" 1906 NO. 14
DISCHARGE CURVE
MEAN VELOCITY CURVE
AREA CURVE
Velocity in feet per second
Area in square feet
Discharge in second-feet

minations of flow are to be other than rough approximations. For stations with beds which shift slowly or are materially changed only during floods, rating tables can be prepared for periods between such changes and satisfactory results obtained with a limited number of measurements, provided that some of them are taken soon after the change occurs. For streams with continually shifting beds, such as the Colorado and Rio Grande, discharge measurements should be made every two or three days and the discharge for intervening days obtained either by interpolation modified by gage height or by Professor Stout's method, which has been described in full in the Nineteenth Annual Report of the United States Geological Survey, Part IV, page 323, and in the Engineering News of April 21, 1904. This method, or a graphical application of it, is also much used in determining the flow at stations where the bed shifts but slowly.

COOPERATION AND ACKNOWLEDGMENTS.

Assistance has been rendered and records furnished by the following, to whom special acknowledgment is due: D. W. Mead, Madison, Wis.; officers and observers of the U. S. Weather Bureau; the Wisconsin Geological and Natural History Survey, E. A. Birge, director and superintendent.

HUDSON BAY DRAINAGE.

GENERAL FEATURES.

All the waters that reach Hudson Bay from the United States pass through Lake Winnipeg and thence into the bay through Nelson River. The two principal tributaries of Lake Winnipeg, and thus, indirectly, of Nelson River, are the Saskatchewan and Red River. The Saskatchewan drains the major portions of the provinces of Alberta and Saskatchewan and the northwestern part of Assiniboia, in the Dominion of Canada, and, through St. Mary River, a small area in northwestern Montana in the United States. Red River drains a large basin in the United States, covering portions of Minnesota and North and South Dakota. Both rivers are large and important.

ST. MARY RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

St. Mary River heads in northern Montana, near the Canadian boundary line, on the eastern slope of the main range of the Rocky Mountains, in a region of perpetual snow and in the midst of numerous glaciers. It starts from the great Blackfoot glacier, probably the largest in the Rocky Mountains within the United States, and receives affluents from at least a dozen lesser glaciers. These small streams

thin a short distance from their sources and flow into a lake in by high mountains, known as Upper St. Mary Lake. ıis lake, separated from it by a narrow strip of land, is Lower r Lake, the aggregate length of the two lakes being about 22 The river flows out of the lower lake, the elevation of which is et above sea level, and within 2 miles is joined by a stream f not quite as large as itself, known as Swiftcurrent Creek, fed by the waters of Grinnell Glacier and four smaller glaciers. ıe confluence of these streams to the international boundary, ce of 12 miles, the St. Mary flows in a northerly direction. g Kennedy Creek a few miles before crossing the boundary. g the province of Alberta it empties into Belly River, its ventually finding their way through the Saskatchewan into Bay.

al has been constructed in Canada by the Canadian Northwest ın Company to divert water from the right bank of St. Mary bout 5 miles below the international boundary line.

ata collected in the basin are valuable for irrigation purposes.

ST. MARY RIVER NEAR BABB, MONT.[a]

ıtation was established April 9, 1902. It is located at Henry ı ranch, about 1 mile east of his house and 35 miles northwest ning, Mont. It is also about 4,500 feet below the foot of Lower r Lake. The conditions at this station and the bench marks ribed in Water-Supply Paper No. 171, page 17, where are given rences to publications that contain data for previous years.

Discharge measurements of St. Mary River near Babb, Mont., in 1906.

	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
...	Freeman and Edson	50	50	1.40	66
...	W. B. Freeman	92	172	2.92	[a] 631
...	Morse and Hartman	90	161	2.82	629
4..	Richards and Hartman	88	132	2.42	420

[a] Meter probably not in good order, causing results to be too low.

ily gage height, in feet, of St. Mary River near Babb, Mont., for 1906.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	1.9	1.9	1.4	1.5	2.8	3.3	3.7	3.0	2.8	2.2	3.0	2.7
.....	1.9	1.9	1.4	1.5	2.8	3.3	3.7	3.0	2.8	2.1	3.1	2.6
.....	1.9	1.9	1.4	1.5	2.9	3.5	3.7	2.9	2.8	2.2	3.1	2.6
.....	1.9	1.9	1.4	1.5	2.9	3.6	3.7	2.9	2.8	2.1	3.1	2.5
.....	1.9	1.9	1.4	1.6	2.9	3.7	3.8	2.9	2.7	2.2	3.0	2.5
.....	1.9	1.9	1.5	1.6	2.9	3.8	3.8	2.9	2.7	2.1	2.9	2.4
.....	1.9	1.9	1.5	1.6	2.9	3.8	3.9	2.8	2.7	2.2	2.8	2.4
.....	1.9	1.9	1.5	1.6	2.9	3.9	3.9	2.8	2.7	2.1	2.9	2.4
.....	1.9	1.9	1.5	1.6	2.9	3.9	4.0	2.8	2.7	2.3	2.7	2.3
.....	1.9	1.9	1.5	1.6	3.0	3.9	4.0	2.8	2.6	2.2	2.2	2.7

[a] Formerly dam site.

Daily gage height, in feet, of St. Mary River near Babb, Mont., for 1906—Conti

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
11	1.9	1.9	1.7	1.6	3.0	3.9	4.1	2.7	2.6	2.3	2.8
12	1.9	1.9	1.7	1.6	3.0	3.9	4.1	2.7	2.5	2.2	2.8
13	1.9	1.9	1.7	1.7	3.1	4.0	4.2	2.7	2.5	2.3	2.9
14	1.9	1.9	1.7	1.7	3.3	4.1	4.1	2.7	2.4	2.2	2.9
15	1.9	1.9	1.7	1.7	3.4	4.2	4.1	2.7	2.4	2.4	3.0
16	1.9	1.9	1.7	1.7	3.6	4.3	4.0	2.7	2.4	2.3	3.0
17	1.9	1.9	1.7	1.7	3.5	4.0	3.9	2.8	2.4	2.4	3.1
18	1.9	1.9	1.5	1.7	3.5	4.0	3.8	2.8	2.3	2.4	3.0
19	1.9	1.9	1.5	1.8	3.4	4.0	3.7	2.8	2.3	2.5	3.0
20	1.9	1.4	1.6	1.8	3.4	3.9	3.6	2.9	2.3	2.4	3.0
21	1.9	1.4	1.6	1.9	3.3	3.9	3.5	2.9	2.2	2.6	2.9
22	1.9	1.4	1.6	2.0	3.3	3.8	3.5	3.0	2.2	2.5	2.9
23	1.9	1.4	1.6	2.1	3.3	3.7	3.4	3.0	2.2	2.6	2.9
24	1.9	1.4	1.6	2.2	3.2	3.7	3.4	3.0	2.2	2.6	2.9
25	1.9	1.4	1.6	2.3	3.2	3.6	3.3	3.1	2.2	2.7	2.9
26	1.9	1.4	1.5	2.5	3.3	3.6	3.2	3.0	2.2	2.6	2.9
27	1.9	1.4	1.5	2.6	3.3	3.5	3.2	3.0	2.1	2.7	2.9
28	1.9	1.4	1.4	2.7	3.3	3.6	3.1	3.0	2.1	2.7	2.9
29	1.9	.....	1.4	2.7	3.3	3.6	3.1	2.9	2.1	2.8	2.9
30	1.9	.....	1.4	2.7	3.3	3.7	3.3	2.9	2.1	2.8	2.9
31	1.9	.....	1.4	.....	3.3	.....	3.3	2.8	.....	3.0	.....

NOTE.—Ice conditions January 1 to February 19, March 11 to 26; gage heights to surface of ice
tically open-channel condition during December.

Rating table for St. Mary River near Babb, Mont., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.40	65	2.20	325	3.00	725	3.80	1,300
1.50	90	2.30	365	3.10	790	3.90	1,380
1.60	115	2.40	410	3.20	855	4.00	1,460
1.70	145	2.50	455	3.30	925	4.10	1,545
1.80	175	2.60	505	3.40	995	4.20	1,630
1.90	210	2.70	555	3.50	1,070	4.30	1,715
2.00	245	2.80	610	3.60	1,145		
2.10	285	2.90	665	3.70	1,220		

NOTE.—The above table is applicable only for open-channel conditions. It is based upon
charge measurements made during 1905 and 1906. It is well defined between gage heights 1.4 an

Monthly discharge of St. Mary River near Babb, Mont., for 1906.

[Drainage area, 177 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-o
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.
January			[a] 70	4,300	0.396
February			[a] 65	3,610	.367
March [b]	90	65	82.7	5,080	.467
April	555	90	218	13,000	1.23
May	1,140	610	841	51,700	4.75
June	1,720	925	1,300	77,400	7.34
July	1,630	790	1,220	75,000	6.89
August	790	555	649	39,900	3.67
September	610	285	432	25,700	2.44
October	725	285	421	25,900	2.38
November	790	555	666	39,600	3.76
December	555	175	283	17,400	1.60
The year	1,720		521	379,000	2.94

[a] Discharge January 1 to February 19 estimated by C. C. Babb.
[b] Discharge estimated March 11 to 25.

NOTE.—Values are rated as follows: January and February, approximate; April to Novemb
lent; March, fair; December, good.

ST. MARY RIVER NEAR CARDSTON, ALBERTA.

is station was established September 4, 1902, near Shaw's ı, one-fourth mile north of the boundary line between the ɜd States and Canada and 17 miles south of Cardston, Alberta. conditions at this station and the bench marks are described in ɜr-Supply Paper No. 171, page 19, where are given also refer- ı to publications that contain data for previous years.

Discharge measurements of St. Mary River near Cardston, Alberta, in 1906.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	Freeman and Edson	90	126	2.90	138
.....	W. B. Freeman	108	341	5.10	[a] 1,350
t 20.....	....do	105	249	4.29	746
ıber 13...	Richards and Hartman	102	231	4.13	650

[a] Meter probably not in good order, causing result to be too low.

Daily gage height, in feet, of St. Mary River near Cardston, Alberta, for 1906.

)ay.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec
.....	3.5	4.25	3.75	.....	4.6	5.45	5.45	4.65	4.55	3.7	4.8	4.05
.....	3.5	4.25	3.8	2.95	4.65	.....	5.4	4.5	4.55	3.75	.....	4.05
.....	3.5	.....	4.1	2.95	4.7	5.6	5.4	4.5	4.45	3.85	4.6	4.0
.....	3.75	4.45	4.2	3.0	.....	5.65	5.45	4.45	4.45	4.0	4.5	3.95
.....	3.75	4.5	.....	3.05	4.7	5.75	5.5	4.4	4.4	4.1	4.5	3.9
.....	3.75	4.6	3.85	3.1	4.7	5.75	5.5	4.3	4.35	4.15	4.45	3.9
.....	3.75	4.6	3.7	3.15	4.65	5.7	5.5	4.25	4.3	4.15	.....	3.8
.....	3.75	4.65	3.6	3.25	4.65	5.55	5.5	4.25	4.3	4.1	4.35	3.7
.....	.....	4.65	3.6	3.3	4.7	5.55	5.6	4.2	4.3	4.05	4.3	3.75
.....	3.75	4.65	3.5	3.3	4.75	5.55	5.6	4.2	4.25	4.1	4.3	3.7
.....	3.75	4.7	.....	3.3	4.8	5.55	5.6	4.2	4.2	.....	4.3	3.6
.....	3.75	4.7	.....	3.35	5.0	5.75	5.6	4.25	4.15	4.1	4.5	.....
.....	3.75	4.7	4.4	3.35	5.1	.....	5.6	4.3	4.15	4.1	4.6	3.5
.....	3.75	4.7	4.45	.....	5.25	5.7	5.4	4.35	4.05	4.1	4.7	3.4
.....	3.75	4.7	4.5	3.35	5.35	5.6	5.35	4.4	4.0	4.1	5.05	3.35
.....	3.75	4.7	4.55	3.4	5.3	5.6	5.3	4.4	3.95	4.1	.....	.....
.....	3.75	4.7	.....	3.5	5.3	5.5	5.2	.....	3.9	4.1	.....	3.3
.....	3.75	4.7	4.6	3.55	5.1	5.55	5.25	4.35	3.85	4.1	5.1	3.3
.....	3.75	4.5	4.6	3.65	5.05	5.4	5.2	4.35	3.8	.....	5.1	3.3
.....	3.75	4.5	4.6	3.75	5.05	5.35	5.15	4.3	3.8	4.2	4.9	3.35
.....	3.75	4.5	4.6	3.8	5.0	5.25	5.05	4.35	.....	4.15	4.95	3.35
.....	3.75	4.5	4.6	4.05	5.05	5.35	5.0	4.5	3.8	4.1	4.85	3.4
.....	3.75	4.5	4.5	4.25	5.05	5.45	4.95	4.6	3.8	4.1	4.8	3.45
.....	3.8	4.5	4.5	4.6	5.1	5.3	4.95	4.75	3.85	4.1	4.7	3.45
.....	4.0	4.35	4.45	4.6	.....	5.25	4.9	4.95	3.85	4.1	4.55	3.5
.....	.....	4.3	4.3	4.65	5.15	.....	4.85	.....	3.85	4.5	4.5	3.5
.....	4.25	4.2	4.2	4.65	5.15	5.55	4.85	4.85	3.8	4.75	4.4	3.45
.....	4.15	.....	3.3	4.65	5.2	5.65	4.75	4.8	3.7	5.0	4.35	3.4
.....	4.2	.....	.....	.....	5.25	5.5	4.65	4.7	3.7	5.0	4.2	3.3
.....	4.2	.....	.....	4.55	5.25	5.55	.....	4.65	3.65	4.95	4.15	.....
.....	4.25	.....	2.90	.....	5.3	.....	4.65	4.6	.....	4.85	.....	.....

ɜ.- Ice conditions January 1 to March 31; river frozen to bottom during greater portion of ice ; gage heights are to ice surface, except for short periods when water overflowed ice. Ice condi-)ecember 9 to 31; gage readings to water surface.

Rating table for St. Mary River near Cardston, Alberta, for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.90	153	3.70	410	4.50	960	5.30	1,900
3.00	174	3.80	460	4.60	1,055	5.40	2,055
3.10	198	3.90	515	4.70	1,155	5.50	2,215
3.20	225	4.00	575	4.80	1,260	5.60	2,385
3.30	255	4.10	640	4.90	1,370	5.70	2,565
3.40	288	4.20	710	5.00	1,490	5.80	2,755
3.50	325	4.30	785	5.10	1,620		
3.60	365	4.40	870	5.20	1,755		

NOTE.—The above table is applicable only for open-channel conditions. It is based upon 22 dis measurements made during 1902-1906. It is well defined between gage heights 2.5 feet and 7 feet

Monthly discharge of St. Mary River near Cardston, Alberta, for 1906.

[Drainage area, 452 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	De in
January			[a] 100	6,150	0.221	
February			[a] 95	5,280	.210	
March			[b] 125	7,690	.277	
April	1,100	160	481	28,600	1.06	
May	1,990	1,060	1,500	92,200	3.32	
June	2,660	1,830	2,280	136,000	5.04	
July	2,380	1,100	1,830	113,000	4.05	
August	1,430	710	946	58,200	2.09	
September	1,010	385	628	37,400	1.39	
October	1,490	410	756	46,500	1.67	
November	1,620	675	1,100	65,500	2.43	
December [c]	607	255	359	22,100	.794	
The year	2,660	.....	850	619,000	1.88	

[a] January and February estimated by C. C. Babb.
[b] Estimated from flow of St. Mary and Swiftcurrent near Babb, Mont.
[c] Flow only slightly affected by ice conditions.

NOTE.—Values are rated as follows: January and February, approximate; March, fair; April vember, excellent; December, good.

SWIFTCURRENT CREEK NEAR BABB, MONT.

This station was established April 8, 1902. It is located one-mile northwest of Henkel's ranch and 36 miles northwest of Brown Mont. The nearest post-office is at Babb, Mont., 2 miles below. conditions at this station and the bench marks are described in Wa Supply Paper No. 171, page 21, where are given also references to p lications that contain data for previous years. The length of chain is now 15.90 feet.

Discharge measurements of Swiftcurrent Creek near Babb, Mont., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	D cha
		Feet.	*Sq. ft.*	*Feet.*	*Sec*
March 31	Freeman and Edson	30	30	2.08	
May 12	W. B. Freeman	55	108	3.60	
August 18	Morse and Hartman	55	71	2.73	
September 14	Richards and Hartman	50	53	2.38	

[a] Meter probably out of order, causing result to be too low.

Daily gage height, in feet, of Swiftcurrent Creek near Babb, Mont., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	2.3	2.3	1.7	2.1	3.2	3.3	3.4	2.7	2.8	2.4	3.2	2.6
.....	2.3	2.3	1.7	2.1	3.1	3.3	3.3	2.7	2.8	2.4	3.0	2.5
.....	2.3	2.3	1.7	2.2	3.1	3.5	3.3	2.7	2.7	2.5	2.9	2.4
.....	2.3	2.3	1.7	2.2	3.2	3.9	3.3	2.7	2.7	2.5	2.9	2.4
.....	2.3	2.3	1.8	2.3	3.3	3.8	3.4	2.7	2.7	2.6	2.9	2.3
.....	2.3	2.3	1.8	2.4	3.3	3.6	3.4	2.6	2.7	2.7	2.9	2.3
.....	2.3	2.3	1.9	2.5	3.2	3.5	3.4	2.6	2.6	2.6	2.8	2.3
.....	2.3	2.3	1.9	2.6	3.2	3.5	3.4	2.6	2.6	2.6	2.8	2.3
.....	2.3	2.3	1.9	2.8	3.1	3.5	3.3	2.6	2.6	2.6	2.8	2.1
.....	2.3	2.3	1.9	2.8	3.3	3.6	3.3	2.5	2.7	2.6	2.8	2.1
.....	2.3	2.3	2.3	2.8	3.4	3.8	3.3	2.5	2.7	2.7	2.9	2.0
.....	2.3	2.3	2.3	2.7	3.6	3.9	3.3	2.5	2.6	2.7	2.9	2.0
.....	2.3	2.3	2.3	2.7	3.6	4.1	3.2	2.5	2.5	2.7	2.9	2.0
.....	2.3	2.3	2.3	2.6	3.6	3.9	3.2	2.5	2.4	2.7	3.0	2.0
.....	2.3	2.3	2.3	2.7	3.7	3.7	3.1	2.6	2.4	2.7	3.0	2.0
.....	2.3	2.3	2.3	2.7	3.7	3.5	3.1	2.6	2.4	2.7	3.1	2.0
.....	2.3	2.3	2.3	2.8	3.5	3.5	3.0	2.6	2.3	2.7	3.3	2.0
.....	2.3	2.3	2.3	2.8	3.4	3.4	3.0	2.6	2.3	2.7	3.2	2.0
.....	2.3	2.3	2.3	2.9	3.1	3.4	3.0	2.6	2.3	2.7	3.1	2.0
.....	2.3	2.3	2.3	2.9	3.1	3.3	2.9	2.7	2.2	2.7	3.1	1.9
.....	2.3	1.6	2.3	3.0	3.2	3.3	2.9	2.7	2.2	2.9	3.0	1.9
.....	2.3	1.6	2.3	3.3	3.2	3.3	2.9	2.8	2.2	3.0	3.0	1.8
.....	2.3	1.6	2.3	3.5	3.3	3.3	2.8	2.8	2.2	3.0	2.9	1.8
.....	2.3	1.6	2.3	3.5	3.3	3.3	2.8	2.8	2.2	3.2	2.8	1.8
.....	2.3	1.6	2.3	3.5	3.3	3.3	2.8	2.9	2.2	3.6	2.8	1.8
.....	2.3	1.6	1.9	3.4	3.3	3.4	2.8	2.9	2.3	3.7	2.8	1.7
.....	2.3	1.6	2.0	3.4	3.3	3.4	2.7	2.9	2.3	3.9	2.7	1.7
.....	2.3	1.6	2.0	3.3	3.3	3.4	2.7	2.8	2.3	3.9	2.6	1.7
.....	2.3	.....	2.0	3.3	3.3	3.5	2.7	2.8	2.3	3.9	2.6	1.7
.....	2.3	.....	2.1	3.2	3.3	3.5	2.7	2.8	2.4	3.7	2.6	1.7
.....	2.3	.....	2.1	.....	3.3	.....	2.7	2.8	.....	3.5	.....	1.7

E.—Ice conditions January 1 to February 20, March 11 to 25, readings are to top of ice. Prac-
open-channel conditions during December.

Rating table for Swiftcurrent Creek near Babb, Mont., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.70	7	2.40	130	3.10	385	3.80	800
1.80	18	2.50	160	3.20	435	3.90	875
1.90	30	2.60	190	3.30	485	4.00	950
2.00	44	2.70	225	3.40	540	4.10	1,025
2.10	60	2.80	260	3.50	600	4.20	1,100
2.20	80	2.90	300	3.60	665	4.30	1,175
2.30	105	3.00	340	3.70	730		

E.—The above table is applicable only for open-channel conditions. It is based upon 11 dis-
measurements made during 1905 and 1906. It is well defined between gage heights 2.1 feet and
t.

Monthly discharge of Swiftcurrent Creek near Babb, Mont., for 1906.

[Drainage area, 101 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
January			[a] 30	1,840	0.297	
February			[a] 30	1,670	.297	
March	40	7	[b] 29.5	1,810	.292	
April	600	40	290	17,800	2.96	
May	720	385	300	30,700	4.95	
June	1,020	485	623	37,100	6.17	
July	540	225	381	23,400	3.77	
August	300	160	220	13,500	2.18	
September	280	90	151	8,980	1.50	
October	975	130	347	21,300	3.44	
November	485	190	308	18,300	3.05	
December	190	7	55.5	3,410	.550	
The year	1,020	7	248	180,000	2.45	

[a] January and February estimated by C. C. Babb. [b] Discharge estimated March 11 to 2

NOTE.—Values are rated as follows: January to March, approximate; April to Novembe lent; December, good.

KENNEDY CREEK NEAR BABB, MONT.

This station was established October 17, 1903. It is locate feet above the ford on the road from Altyn, Mont., to Card Alberta, and is 37 miles northwest of Browning, Mont., and a 4 miles north of Babb post-office. The station is situated wher creek emerges from the canyon, about 1½ miles above its confl with St. Mary River. The conditions at this station and the b marks are described in Water-Supply Paper No. 171, page 24, w are given also references to publications that contain data for p ous years.

Discharge measurements of Kennedy Creek near Babb, Mont., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	d
		Feet.	*Sq. ft.*	*Feet.*	
March 31	Freeman and Edson	19	19	5.74	
May 12	W. B. Freeman	57	72	6.38	
August 18	Morse and Hartman	50	34	5.78	
September 14	Richards and Hartman	51	43	5.91	

[a] Meter probably out of order, causing result to be too low.

RED RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Red River rises in Lake Traverse, on the boundary line betw South Dakota and Minnesota, and flows almost due north into L Winnipeg, its waters finally reaching Hudson Bay through Nel *River*. It drains a large area in the United States, including *tions* of Minnesota and of South and North Dakota.

The basin is characterized by level topography, broken in places by moraines and other glacial deposits. The greater part of it is prairie land, and its eastern half comprises some woods and a great abundance of lakes. The main river has cut a deep channel in its broad, level valley, which includes about 9,000,000 acres of excellent agricultural land. The heavy spring rains cause sudden freshets, which frequently entail considerable loss of life and property. The principal tributaries of the stream from the United States are Sheyenne and Pembina rivers from the west and Ottertail and Red Lake rivers from the east. Mouse River drains into it through Assiniboine River. A number of water powers have been developed during recent years on tributaries from both sides.

The data collected in this basin are valuable for water power and drainage purposes.

RED RIVER AT FARGO, N. DAK.

This station was established May 27, 1901. It is located at the bridge connecting Front street, Fargo, N. Dak., with Main street, Moorhead, Minn. Gage heights are furnished by the United States Weather Bureau. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 27, where are given also references to publications that contain data for previous years.

Discharge measurements of Red River at Fargo, N. Dak., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
November 18	R. Richards	108	410	8.84	760
1906.					
April 14	E. F. Chandler	90	600	13.69	[a] 2,390
June 27	do	120	774	12.03	1,630
September 10	do	110	533	10.04	971
October 27	do	112	567	10.20	987

[a] At Northern Pacific Railway bridge.

Daily gage height, in feet, of Red River at Fargo, N. Dak., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	8.6	8.6	9.8	12.6	10.9	12.7	12.2	10.9	11.1	10.5	10.6	11.0
2				13.2	11.0	12.5	12.2	11.1	10.9	10.4	10.6	
3				13.4	11.1	12.4	12.5	11.4	10.7	10.3	10.6	
4				13.5	11.2	12.2	12.6	11.3	10.6	10.2	10.5	
5				13.5	11.3	12.1	12.7	11.4	10.5	10.1	10.5	
6				13.7	11.4	12.0	12.7	11.5	10.4	10.0	10.4	
7				14.1	11.4	12.1	12.7	11.4	10.2	10.0	10.4	
8			10.2	14.9	11.4	12.1	12.6	11.3	10.0	9.9	10.3	
9			10.8	15.5	11.3	12.2	12.5	11.2	10.0	9.8	10.2	
10			11.2	14.9	11.2	12.2	12.3	11.1	10.0	9.6	10.1	
11				13.3	11.1	12.3	12.2	11.0	10.1	9.6	10.1	
12		8.6		12.3	11.2	12.2	12.0	10.9	10.0	9.6	10.1	
13				12.4	10.9	12.1	11.8	10.8	9.9	9.5	10.1	
14				13.5	10.8	12.0	11.8	10.7	9.9	9.5	10.0	
15				14.2	10.7	12.0	11.8	10.6	9.9	9.5	10.0	

Daily gage height, in feet, of Red River at Fargo, N. Dak., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
16	.....	.....	.....	14.5	12.5	12.0	11.6	10.5	9.9	9.3	9.4	.....
17	.....	.....	.....	14.9	14.0	11.9	11.5	10.4	9.9	9.5	9.8	.....
18	.....	.....	.....	15.0	13.8	12.0	11.5	10.6	9.9	9.5	9.6	.....
19	.....	.....	.....	14.5	13.3	12.0	11.5	10.8	9.9	9.5	9.4	.....
20	.....	.....	10.0	13.7	12.7	12.0	11.4	10.8	10.0	9.3	9.2	.....
21	.....	.....	.....	12.9	12.4	12.0	11.3	10.8	10.0	9.3	.....	.....
22	.....	9.8	.....	11.0	12.2	11.9	11.2	10.9	10.2	9.3	.....	.....
23	.....	.....	.....	11.8	12.1	11.9	11.1	10.8	10.4	9.4	.....	.....
24	.....	.....	.....	11.5	12.0	11.8	11.1	10.8	10.5	9.5	.....	10.5
25	.....	.....	10.0	11.2	11.9	11.8	11.0	10.9	10.8	9.6	.....	.....
26	.....	.....	10.0	11.0	12.1	12.0	10.9	10.9	10.8	10.0	.....	.....
27	.....	.....	10.0	10.9	12.8	12.0	10.9	10.9	10.8	10.2	9.6	.....
28	.....	.....	10.2	10.8	12.5	12.0	10.9	11.0	10.7	10.5	9.8	.....
29	.....	.....	10.5	10.8	12.7	12.2	10.9	11.1	10.6	10.6	10.4	.....
30	.....	.....	11.5	10.8	12.8	12.2	10.9	11.3	10.6	10.6	11.0	.....
31	.....	.....	12.1	.....	12.9	.....	10.9	11.3	.....	10.6	.....	.....

NOTE.—Ice conditions January 1 to April 6 and November 21 to December 31; ice 2 to 3 feet thick during first part of year and 0.5 to 1.5 feet during latter part of year.

Rating table for Red River at Fargo, N. Dak., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
8.80	653	10.10	1,008	11.40	1,429	13.40	2,185
8.90	678	10.20	1,038	11.50	1,464	13.60	2,266
9.00	703	10.30	1,069	11.60	1,499	13.80	2,348
9.10	729	10.40	1,100	11.70	1,535	14.00	2,430
9.20	755	10.50	1,131	11.80	1,571	14.20	2,512
9.30	781	10.60	1,163	11.90	1,607	14.40	2,594
9.40	808	10.70	1,195	12.00	1,644	14.60	2,676
9.50	835	10.80	1,227	12.20	1,718	14.80	2,758
9.60	863	10.90	1,260	12.40	1,793	15.00	2,840
9.70	891	11.00	1,293	12.60	1,869	16.00	3,260
9.80	920	11.10	1,326	12.80	1,947		
9.90	949	11.20	1,360	13.00	2,025		
10.00	978	11.30	1,394	13.20	2,105		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 4 discharge measurements made during 1906 and a number of older measurements. It is fairly well defined.

Monthly discharge of Red River at Fargo, N. Dak., for 1906.

[Drainage area, 6,020 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
April[a]	3,050	1,230	2,050	122,000	0.341	0.38
May	2,430	1,200	1,630	100,000	.271	.31
June	1,910	1,570	1,680	100,000	.279	.31
July	1,910	1,260	1,550	95,300	.257	.30
August	1,460	1,100	1,290	79,300	.214	.25
September	1,330	949	1,070	63,700	.178	.20
October	1,160	781	940	57,800	.156	.18
November[b]	1,160	.....	942	56,100	.156	.17
The period				674,000		

[a] River not materially affected by ice conditions first week in April.
[b] Discharge estimated November 21 to 30.

NOTE.—Values are rated as follows: April, good; May to October, excellent; November, fair.

RED RIVER AT GRAND FORKS, N. DAK.

This station was established May 26, 1901. It is located at the Northern Pacific Railway bridge at Grand Forks, N. Dak. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 29, where are given also references to publications that contain data for previous years.

Discharge measurements of Red River at Grand Forks, N. Dak., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
December 22	E. F. Chandler	208	1,110	[a] 9.05	[b] 1,840
1906.					
January 29	Chandler and Richards	207	1,060	[c] 9.45	[b] 1,770
March 5	do	205	949	[d] 9.51	[b] 1,550
March 23	do	207	1,110	[e] 10.24	[b] 1,880
April 9	R. Richards	576	9,140	32.40	23,000
August 11	E. F. Chandler	161	1,510	10.27	3,710
November 5	do	160	1,140	8.21	2,410
December 21	do	198	1,070	[f] 8.59	[b] 1,700

[a] Gage height to under side of ice 8.02.
[b] Ice measurements; gage heights are to the water surface in a hole in the ice.
[c] Gage height to under side of ice 7.79.
[d] Gage height to under side of ice 7.01.
[e] Gage height to under side of ice 7.82.
[f] Gage height to under side of ice 7.71.

Daily gage height, in feet, of Red River at Grand Forks, N. Dak., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				17.8	18.5	16.4	13.1	9.6	8.7	8.4	7.9	8.8
2				21.9	17.8	16.3	13.2	9.9	9.1	8.5	8.35	.....
3		9.5	9.5	25.1	17.4	16.1	13.25	10.1	9.15	8.4	8.35	.....
4				27.9	17.25	15.8	13.8	10.4	9.2	8.25	8.3	.....
5			9.5	30.55	17.25	15.4	14.4	10.6	9.05	8.3	8.25	.....
6	9.35			32.5	17.25	15.25	14.65	10.25	8.9	8.4	8.4	.....
7				33.5	17.2	15.1	14.4	10.85	8.55	8.45	8.05	.....
8				33.3	17.1	14.75	14.15	10.8	8.4	8.3	8.1	8.9
9				32.25	16.9	14.5	13.85	10.6	8.3	8.1	8.2	.....
10		9.35	9.7	31.0	16.7	14.35	13.5	10.5	8.3	7.85	8.5	.....
11				30.1	16.35	14.2	13.0	10.25	8.3	8.0	8.25	.....
12				29.25	16.0	14.2	12.75	10.1	8.2	7.85	8.25	.....
13	9.2			28.9	15.65	14.0	12.35	9.85	8.25	7.8	8.1	.....
14				29.5	15.25	13.85	11.95	9.65	8.1	7.7	8.1	.....
15				31.1	15.5	13.65	11.65	9.55	7.9	7.8	8.1	8.4
16				34.0	16.15	13.3	11.3	9.4	7.8	7.7	7.6	.....
17		9.2	10.3	35.5	16.75	13.0	11.1	9.3	7.8	7.6	7.2	.....
18				36.0	16.75	12.85	10.85	9.2	7.9	7.7	7.15	.....
19				35.85	16.9	12.8	10.7	9.05	7.85	7.6	7.4	.....
20	9.4			35.15	17.2	13.1	10.5	9.0	8.0	7.55	.....	.....
21				34.2	17.1	13.35	10.45	9.0	7.95	7.55	7.5	.....
22				32.9	17.05	13.3	10.5	9.0	8.0	7.45	.....	8.4
23			10.2	31.2	16.85	13.1	10.25	8.95	8.1	7.4	.....	.....
24		9.15	10.1	29.4	16.7	13.0	10.15	9.0	8.1	7.35	7.6	.....
25				27.35	16.45	12.9	10.2	9.15	8.2	7.3	.....	.....
26				25.5	16.3	12.8	10.2	9.1	8.6	7.25	.....	.....
27	9.5			23.55	16.7	12.85	10.2	8.9	8.65	7.3	.....	.....
28				22.0	17.25	13.15	10.0	8.95	8.55	7.4	.....	.....
29	9.45			20.55	17.35	13.2	9.8	9.2	8.4	7.7	.....	8.4
30				19.4	17.05	13.2	9.8	9.15	8.5	8.4	.....	.....
31			14.0	.....	16.8	.....	9.7	8.8	.....	7.6	.....	.....

NOTE.—Ice conditions January 1 to April 8; gage heights were to water surface; average ice thickness, 2 feet. Ice condition November 13 to December 31; average thickness 1.1 feet.

Rating table for Red River at Grand Forks, N. Dak., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
7.00	1,800	8.80	2,700	11.20	4,140	22.00	12,790
7.10	1,846	8.90	2,755	11.40	4,270	23.00	13,730
7.20	1,892	9.00	2,810	11.60	4,400	24.00	14,670
7.30	1,939	9.10	2,865	11.80	4,530	25.00	15,640
7.40	1,986	9.20	2,920	12.00	4,660	26.00	16,640
7.50	2,034	9.30	2,975	12.20	4,790	27.00	17,650
7.60	2,082	9.40	3,030	12.40	4,920	28.00	18,670
7.70	2,131	9.50	3,090	12.60	5,060	29.00	19,720
7.80	2,180	9.60	3,150	12.80	5,200	30.00	20,790
7.90	2,230	9.70	3,210	13.00	5,340	31.00	21,880
8.00	2,280	9.80	3,270	14.00	6,040	32.00	22,980
8.10	2,330	9.90	3,330	15.00	6,790	33.00	24,100
8.20	2,380	10.00	3,390	16.00	7,500	34.00	25,250
8.30	2,430	10.20	3,510	17.00	8,300	35.00	26,400
8.40	2,480	10.40	3,630	18.00	9,190	36.00	27,550
8.50	2,535	10.60	3,750	19.00	10,040		
8.60	2,590	10.80	3,880	20.00	10,940		
8.70	2,645	11.00	4,010	21.00	11,850		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1901-1906. It is well defined.

Monthly discharge of Red River at Grand Forks, N. Dak., for 1906.

[Drainage area, 25,000 square miles.[a]]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
January			[b]1,750	108,000	0.070	0.08
February			[b]1,590	88,300	.064	.07
March			[b]1,890	116,000	.076	.09
April	27,600	7,000	[c]19,800	1,180,000	.792	.88
May	9,620	6,980	8,220	505,000	.329	.38
June	7,880	5,200	6,060	361,000	.242	.27
July	6,530	3,210	4,560	280,000	.182	.21
August	3,910	2,700	3,180	196,000	.127	.15
September	2,920	2,180	2,470	147,000	.099	.11
October	2,540	1,920	2,200	135,000	.088	.10
November			[d]2,150	128,000	.086	.10
December			[b]1,630	100,000	.065	.07
The year			4,620	3,340,000	.185	2.51

[a] Revised since 1905 report.
[b] Estimated from gage heights and ice measurements.
[c] Discharge estimated April 1 to 8.
[d] Discharge November 20 to 30 estimated.

NOTE. Values are rated as follows: January to March and December, fair; April and November, good; May to October, excellent.

OTTERTAIL RIVER NEAR FERGUS FALLS, MINN.

This station was established May 9, 1904. It is located at Three-mile Bridge, about 3½ miles northeast of Fergus Falls, Minn. The conditions at this station and the bench marks[a] are described in Water-Supply Paper No. 171, page 33, where are given also references to publications that contain data for previous years.

[a] During 1906 the gage was attached to the guard rail at station "20" on the lower side of the bridge. The bench mark is the center of the lowest bolt holding the vertical strap iron tie-rod against the face of the stone abutment on the right bank; it is about 3 feet above the lower angle of the abutment; elevation; 7.75 feet above gage datum.

Discharge measurements of Ottertail River near Fergus Falls, Minn., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
September 4	R. Richards	98	240	3.84	759
November 4	E. F. Chandler	98	202	3.49	539
1906.					
May 14	E. F. Chandler	93	225	3.89	786
June 25	do	92	264	4.30	1,010

Daily gage height, in feet, of Ottertail River near Fergus Falls, Minn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1				4.8	3.7	3.95	4.25	3.95	3.85	3.7	3.7	
2				4.6	3.75	4.0	4.25	3.95	3.85	3.7	3.7	
3				4.3	3.8	4.0	4.25	3.95	3.85	3.7	3.7	
4				4.0	3.8	4.0	4.25	3.95	3.85	3.7	3.7	
5				4.0	3.8	4.0	4.25	3.9	3.85	3.7	3.7	
6				3.5	3.8	4.1	4.25	3.9	3.85	3.7	3.65	
7				3.2	3.8	4.1	4.25	3.9	3.85	3.7	3.65	
8				3.2	3.8	4.15	4.25	3.85	3.85	3.7	3.65	
9				3.3	3.85	4.2	4.25	3.85	3.85	3.7	3.6	
10				3.3	3.85	4.2	4.2	3.8	3.85	3.7	3.6	
11	4.55			3.4	3.85	4.2	4.15	3.8	3.8	3.7	3.6	
12				3.4	3.85	4.2	4.15	3.8	3.8	3.7	3.6	
13				3.4	3.85	4.2	4.15	3.8	3.8	3.7	3.6	
14			4.7	3.4	3.9	4.2	4.15	3.8	3.8	3.7	3.6	
15				3.4	3.9	4.2	4.15	3.75	3.8	3.7	3.65	
16		4.6		3.4	3.9	4.2	4.15	3.75	3.8	3.7	3.65	
17				3.4	3.9	4.2	4.1	3.75	3.8	3.7	3.7	
18				3.4	3.9	4.2	4.1	3.75	3.8	3.7	3.9	
19				3.4	3.9	4.2	4.1	3.75	3.8	3.7	4.0	
20				3.4	3.9	4.2	4.0	3.7	3.8	3.7	4.5	
21				3.45	3.9	4.2	4.0	3.7	3.85	3.75	4.8	
22				3.45	3.9	4.2	4.0	3.7	3.8	3.8	4.8	4.65
23				3.45	3.9	4.2	4.0	3.75	3.8	3.8	4.8	
24				3.5	3.9	4.2	4.0	3.8	3.75	3.8	4.8	
25				3.5	3.95	4.25	4.0	3.85	3.75	3.75		
26	4.7			3.6	3.95	4.25	4.0	3.85	3.75	3.75		
27				3.65	3.95	4.25	4.0	3.85	3.75	3.7		
28				3.65	3.95	4.25	4.0	3.85	3.7	3.7		
29				3.65	3.95	4.25	4.0	3.85	3.7	3.7		
30				3.7	3.95	4.25	4.0	3.85	3.7	3.7		
31			4.8		3.95		3.95	3.85		3.7		

NOTE.—Ice conditions January 1 to April 6, also November 19 to December 31; gage heights were to water surface. The following comparative readings were made:

Comparative ice and water gage heights of Ottertail River near Fergus Falls, Minn.

Date.	Water surface.	Top of ice.	Thickness of ice.
January 11	4.55	4.65	1.3
January 26	4.7	4.8	1.6
February 16	4.6	4.7	1.7
March 14	4.7	4.8	1.6

Rating table for Ottertail River near Fergus Falls, Minn., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.20	402	3.50	552	3.80	726	4.10	921
3.30	449	3.60	607	3.90	789	4.20	987
3.40	499	3.70	665	4.00	855		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 12 discharge measurements made during 1904–1906. It is well defined between gage heights 2.8 feet and 3.8 feet.

Monthly discharge of Ottertail River near Fergus Falls, Minn., for 1906.

[Drainage area, 1,310 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
April	665	402	[a] 517	30,800	0.395	0.44
May	822	665	772	47,500	.589	.68
June	1,020	822	965	57,400	.737	.82
July	1,020	822	932	57,300	.711	.82
August	822	665	742	45,600	.566	.65
September	758	665	727	43,300	.555	.62
October	726	665	674	41,400	.515	.59
November (1–24)	855	607	[b] 686	32,600	.524	.60
The period				356,000		

[a] Discharge estimated April 1 to 6. [b] Discharge estimated November 20 to 24.

NOTE.—Values are rated as follows: April and November, good; May to October, excellent.

SHEYENNE RIVER NEAR HAGGART, N. DAK.

This station was established March 22, 1902. It is located near the station of Haggart, on the Northern Pacific Railway, 6 miles west of Fargo, N. Dak., at a private wagon bridge about one-fourth mile north of the railroad. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 35, where are given also references to publications that contain data for previous years.

Discharge measurements of Sheyenne River near Haggart, N. Dak., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
March 30	R. Richards	53	175	6.60	198
June 22	Chandler and Richards	46	154	4.70	173
July 11	R. Richards	47	147	4.60	158
July 29	Hanna and Chandler	44	134	4.42	146
August 22	R. Richards	54	216	6.01	268
November 18	E. F. Chandler	39	105	3.64	69
1906.					
April 14	E. F. Chandler	72	530	10.89	948
June 27	do	48	208	5.92	317
September 10	Grover and Chandler	39	105	3.45	66

Daily gage height, in feet, of Sheyenne River near Haggart, N. Dak., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	9.5	6.2	6.7	5.4	4.7	3.3	3.3	3.2	3.5
2	.....	.....	.....	9.65	6.2	6.5	5.5	4.7	3.3	3.3	3.2	.....
3	.....	.....	.....	8.7	6.2	6.4	5.5	4.6	3.3	3.3	3.2	.....
4	.....	.....	.....	7.2	6.1	6.2	5.4	4.6	3.3	3.3	3.2	.....
5	.....	.....	.....	7.1	6.1	6.2	5.3	4.5	3.2	3.2	3.2	.....
6	4.5	.....	.....	6.6	6.1	6.1	5.1	4.4	3.2	3.2	3.2	.....
7	.....	.....	.....	6.7	6.0	6.1	5.0	4.4	3.2	3.2	3.2	.....
8	.....	.....	.....	7.2	6.0	6.1	4.7	4.3	3.1	3.2	3.2	.....
9	.....	.....	.....	7.5	5.7	6.0	4.7	4.3	3.1	3.2	3.3	.....
10	.....	.....	.....	8.1	5.6	6.0	4.6	4.3	3.0	3.2	3.3	.....
11	.....	.....	.....	9.1	5.4	6.0	4.6	4.2	3.0	3.2	3.3	3.9
12	.....	.....	.....	9.7	5.3	5.7	4.6	4.2	3.0	3.2	3.3	.....
13	.....	.....	.....	10.3	5.2	5.7	4.5	4.2	3.0	3.2	3.3	.....
14	.....	.....	.....	10.6	5.0	5.6	4.5	4.1	3.0	3.2	3.3	.....
15	.....	.....	.....	11.5	4.7	5.5	4.5	4.1	3.1	3.2	3.3	.....
16	.....	5.6	5.6	11.7	5.1	5.5	4.5	4.0	3.1	3.2	3.4	.....
17	.....	.....	.....	11.6	5.2	5.5	4.4	4.0	3.2	3.2	3.4	.....
18	.....	.....	.....	11.2	5.5	5.6	4.3	3.7	3.2	3.2	3.4	.....
19	.....	.....	.....	10.7	6.0	5.7	4.3	3.7	3.3	3.2	3.4	.....
20	.....	.....	.....	10.5	6.2	5.7	4.2	3.6	3.3	3.2	3.4	.....
21	.....	.....	.....	10.2	6.1	5.6	4.2	3.6	3.4	3.2	3.4	.....
22	.....	.....	.....	9.7	5.7	5.5	4.2	3.6	3.4	3.2	3.4	.....
23	.....	.....	.....	9.2	5.6	5.5	4.1	3.6	3.5	3.2	3.4	.....
24	.....	.....	8.6	8.4	5.5	5.5	4.1	3.5	3.5	3.2	3.5	.....
25	.....	.....	9.2	7.6	5.7	5.5	4.1	3.5	3.5	3.2	3.5	.....
26	4.6	.....	8.7	7.2	6.0	5.6	4.1	3.5	3.4	3.2	3.5	.....
27	.....	.....	8.0	6.7	6.5	5.6	4.2	3.5	3.4	3.2	3.5	.....
28	.....	.....	7.6	6.6	7.2	5.5	4.4	3.4	3.4	3.2	3.5	.....
29	.....	.....	8.1	6.5	7.1	5.5	4.5	3.4	3.3	3.2	3.5	.....
30	.....	.....	8.4	6.2	7.1	5.4	4.6	3.4	3.3	3.2	3.5	.....
31	.....	.....	9.2	.....	7.0	.....	4.7	3.3	.....	3.2	.....	4.0

NOTE.—Ice conditions January 1 to April 3. Gage heights probably to water surface. Thickness of ice, 1.8 feet approximately. Ice conditions also November 20 to December 31.

Rating table for Sheyenne River near Haggart, N. Dak., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.00	32	4.30	131	5.60	269	7.80	554
3.10	38	4.40	140	5.70	281	8.00	580
3.20	44	4.50	149	5.80	294	8.20	606
3.30	51	4.60	159	5.90	307	8.40	632
3.40	58	4.70	169	6.00	320	8.60	658
3.50	65	4.80	179	6.20	346	8.80	684
3.60	72	4.90	189	6.40	372	9.00	710
3.70	80	5.00	200	6.60	398	10.00	840
3.80	88	5.10	211	6.80	424	11.00	970
3.90	96	5.20	222	7.00	450	12.00	1,100
4.00	104	5.30	233	7.20	476		
4.10	113	5.40	245	7.40	502		
4.20	122	5.50	257	7.60	528		

NOTE.—The above table is applicable only for open-channel conditions. It is based on the discharge measurements made during 1903–1906. It is fairly well defined.

Monthly discharge of Cheyenne River near Haggart, N. Dak., for 1905–6.

[Drainage area, 5,400 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec-ft. per sq. mile.	Depth in inches.
1905.[a]						
April (3-30)	385	113	201	11,200	0.037	0.04
May	814	96	326	20,000	.060	.07
June	333	169	206	12,300	.038	.04
July	398	88	177	10,900	.033	.04
August	684	104	303	18,600	.056	.06
September	159	80	120	7,140	.022	.02
October	104	65	79.7	4,900	.015	.02
November	96	.....	[b] 76.5	4,550	.014	.02
The period				89,600		
1906.						
April	1,060	346	682	40,600	0.126	0.14
May	476	169	311	19,100	.058	.07
June	411	245	295	17,600	.055	.06
July	257	113	162	9,960	.030	.03
August	169	51	104	6,400	.019	.02
September	65	32	47.5	2,830	.0088	.01
October	51	44	44.9	2,760	.0083	.01
November	58	44	[c] 52.6	3,130	.0097	.01
The period				102,000		

[a] For 1905 gage heights see Water-Supply Paper No. 171.
[b] Discharge estimated November 1 to 17, 1905.
[c] Discharge estimated November 24 to 30, 1906.

NOTE.—Values are rated as follows: June and July, 1905, excellent; remainder of 1905, good. It is impossible to determine the accuracy of the 1906 values which are subject to large errors, probably being much too low. This is due to the appointment of a new observer for 1906, who recorded the gage height as 0.4 foot less than the hydrographer on the days when measurements were made.

RED LAKE RIVER AT CROOKSTON, MINN.

The gaging station was established May 19, 1901. It is located at the bridge connecting Robert and St. Paul streets, Crookston, known as the "Sampson Addition" bridge. It is about one-sixth mile west of the Great Northern Railway station. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 37, where are given also references to publications that contain data for previous years.

Discharge measurements of Red Lake River at Crookston, Minn., 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec-ft.*
November 20	E. F. Chandler	176	628	5.90	1,690
1906.					
February 12	Chandler and Richards	174	471	6.75	[a] 764
April 16	E. F. Chandler	246	3,660	20.13	14,100
June 30	do	180	715	6.72	1,990
September 11	Grover and Chandler	173	405	4.80	968

[a] Ice measurement; gage height to undersurface of ice is 5.29 feet; ice thickness 0.7 foot to 2.7 feet. The discharge was about 45 per cent of the open-channel rating for gage height 6.75 feet.

Daily gage height, in feet, of Red Lake River at Crookston, Minn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	6.8	7.0	7.0	12.4	10.4	8.05	6.7	5.7	5.4	5.0	5.2	5.0
.....	6.7	.....	.....	14.05	10.0	8.15	6.5	5.9	5.4	5.0	5.0	5.2
.....	6.6	.....	.....	14.46	9.6	7.92	6.65	5.8	5.85	(5.25)	5.0	5.1
.....	6.7	.....	6.85	15.77	9.5	7.8	6.45	5.5	5.55	5.5	4.5	5.3
.....	6.7	.....	.....	15.3	9.5	(7.75)	6.55	5.6	5.3	5.25	4.2	5.0
.....	6.8	7.1	7.0	12.39	9.6	7.72	6.5	5.65	5.2	5.2	4.4	5.4
.....	6.8	.....	6.75	12.5	9.45	7.45	6.4	5.8	5.5	5.5	4.5	5.5
.....	6.7	.....	6.8	10.3	9.25	7.4	6.2	5.35	5.25	5.05	4.5	5.6
.....	6.8	.....	.....	11.15	9.1	7.4	6.15	5.6	5.5	4.9	4.6	5.5
.....	6.9	7.2	.....	11.67	8.95	7.45	6.05	5.7	4.85	4.8	4.2	5.6
.....	6.8	.....	7.1	12.1	8.9	7.55	6.2	5.65	5.05	5.15	4.3	5.6
.....	6.7	.....	.....	13.18	8.8	7.3	6.15	5.5	5.1	4.75	4.3	5.6
.....	6.7	.....	.....	14.41	8.7	7.2	6.1	5.55	5.35	5.0	4.2	5.5
.....	6.7	.....	.....	19.78	8.6	7.08	6.05	5.7	4.85	4.6	4.1	5.4
.....	.....	.....	6.9	20.97	8.7	7.0	6.0	5.9	5.05	5.1	4.5	5.6
.....	.....	.....	.....	19.81	8.6	6.8	6.0	6.6	5.35	5.05	4.2	5.5
.....	.....	6.5	.....	18.45	8.55	6.6	5.9	6.0	5.5	4.95	4.2	5.6
.....	.....	.....	6.8	16.92	8.9	6.45	5.9	6.15	4.5	4.6	4.2	5.5
.....	.....	.....	.....	15.6	8.7	6.85	5.9	5.9	5.0	4.15	4.2	5.6
.....	.....	6.55	7.25	14.6	8.5	6.65	5.9	5.8	5.4	4.5	4.2	5.6
.....	.....	.....	.....	13.75	8.25	6.4	6.0	6.0	5.25	4.7	4.9	5.5
.....	.....	.....	7.05	13.0	8.05	6.65	6.0	5.7	5.05	4.4	4.7	5.6
.....	.....	.....	7.15	12.4	7.85	6.65	5.9	5.25	4.9	4.5	4.3	5.6
.....	.....	6.5	7.2	12.1	7.75	6.65	5.85	5.55	5.35	4.5	4.3	5.6
.....	7.1	.....	6.95	11.9	7.85	6.6	5.9	5.55	5.5	4.6	4.7	5.6
.....	.....	.....	7.05	11.5	7.72	6.55	5.9	5.5	5.55	4.3	4.3	5.6
.....	.....	6.8	7.1	11.2	7.55	6.68	5.8	5.6	5.5	4.2	4.9	5.6
.....	7.2	.....	7.15	11.0	7.5	6.6	5.75	5.75	5.25	4.4	5.0	5.6
.....	.....	.....	9.62	10.9	7.7	6.65	5.8	5.4	5.0	4.4	4.9	5.6
.....	.....	.....	11.1	.....	7.7	6.62	5.8	5.3	5.35	4.5	5.0	5.6
.....	7.4	.....	11.45	.....	7.8	.....	5.65	5.5	....	4.7	.....	5.6

NOTE.—Ice conditions January 1 to April 4, there being a narrow, open channel from January 1 to Gage readings to water surface January 1 to 14, and to top of ice during remainder of ice period. Condition also during December, except for narrow channel during part of the month.

Rating table for Red Lake River at Crookston, Minn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.10	615	5.20	1,220	6.30	1,950	7.80	3,095
4.20	660	5.30	1,280	6.40	2,020	8.00	3,255
4.30	710	5.40	1,340	6.50	2,095	8.20	3,415
4.40	760	5.50	1,400	6.60	2,170	8.40	3,575
4.50	815	5.60	1,465	6.70	2,245	8.60	3,735
4.60	870	5.70	1,530	6.80	2,325	8.80	3,895
4.70	925	5.80	1,600	6.90	2,395	9.00	4,055
4.80	980	5.90	1,670	7.00	2,470	9.20	4,225
4.90	1,040	6.00	1,740	7.20	2,620	9.40	4,395
5.00	1,100	6.10	1,810	7.40	2,775		
5.10	1,160	6.20	1,880	7.60	2,935		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 24 discharge measurements made during 1902-1906. It is well defined. Above gage height 9 feet the rating curve is tangent, the difference being 85 per tenth.

Monthly discharge of Red Lake River at Crookston, Minn., for 1906.

[Drainage area, 5,520 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
January[a]			1,500	92,200	0.272	0.31
February[a]			1,020	56,600	.185	.19
March[a]			1,500	92,200	.272	.31
April[b]	14,200	5,880	8,090	481,000	1.47	1.64
May	5,240	2,860	3,780	232,000	.685	.79
June	3,380	2,020	2,540	151,000	.460	.51
July	2,240	1,500	1,800	111,000	.326	.38
August	1,840	1,250	1,520	93,500	.275	.32
September	1,640	815	1,260	75,000	.228	.25
October	1,400	638	983	60,400	.178	.21
November	1,220	660	836	49,700	.151	.17
The period				1,490,000		

[a] Estimated from gage heights and one ice measurement.
[b] Discharge, April 1 to 4, estimated.

NOTE.—Values are rated as follows: January and March, approximate; February, fair; April to October, excellent; November good.

PEMBINA RIVER NEAR NECHE, N. DAK.

The gaging station was established April 29, 1903. It is located at the Great Northern Railway bridge, two-thirds of a mile north of the railroad station at Neche, N. Dak. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 40, where are given also references to publications that contain data for previous years.

Discharge measurements of Pembina River near Neche, N. Dak., in 1904 and 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
April 18	R. Richards	85	634	11.85	[a] 1,230
April 26	do	92	1,490	18.12	3,200
May 23	do	96	909	13.28	2,230
June 8	E. C. Murphy	86	837	12.04	1,780
July 9	R. Richards	79	488	8.51	971
August 16	do	72	299	5.70	363
October 17	L. L. Wilcox	70	274	5.22	240
1906.					
April 23	R. Richards	70	220	4.47	288
June 11	E. F. Chandler	70	246	4.88	372
August 15	do	66	157	3.67	140
October 22	do	66	178	3.67	132

[a] Discharge affected by ice jam below station.

Daily gage height, in feet, of Pembina River near Neche, N. Dak., for 1906.[a]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	4.0	4.2	4.1	4.4	3.5	3.65	3.7	3.65
2	7.5	4.15	4.3	4.3	3.5	3.7	3.7	3.65
3	8.5	4.15	4.35	4.2	3.5	3.7	3.7	3.65
4	9.0	4.15	4.35	4.1	3.5	3.7	3.75	3.65
5	8.5	4.1	4.3	4.2	3.5	3.65	3.75	3.65
6	8.0	4.1	4.3	4.3	3.5	3.65	3.75	3.6
7	7.5	4.1	4.3	4.4	3.5	3.65	3.75	3.5
8	6.5	4.05	4.4	4.35	3.5	3.65	3.75	3.5
9	6.0	4.05	4.45	4.3	3.5	3.65	3.75	3.5
10	5.5	4.0	4.6	4.2	3.6	3.65	3.75	3.5

[a] 1904 gage heights published in Water-Supply Paper No. 130.

ily gage height, in feet, of Pembina River near Neche, N. Dak., for 1906—Continued.

Days.	Apr.	May.	June.	July.	Aug.	Sept	Oct.	Nov.
.....	5.0	3.95	4.65	4.15	3.7	3.65	3.7	3.3
.....	4.9	3.95	4.6	4.1	3.7	3.65	3.7	3.05
.....	4.8	3.9	4.5	3.9	3.7	3.65	3.7	3.05
.....	4.8	3.9	4.4	3.8	3.7	3.8	3.75	3.1
.....	4.85	3.9	4.3	3.8	3.65	3.8	3.75	3.1
.....	4.8	3.9	4.2	.....	3.65	3.75	3.7	3.2
.....	4.8	3.9	4.1	3.7	3.65	3.75	3.7	3.25
.....	4.75	3.9	4.1	3.7	3.65	3.75	3.7	3.35
.....	4.7	3.95	4.45	3.65	3.65	3.7	3.7	3.35
.....	4.6	3.95	4.45	3.6	3.6	3.7	3.7	.....
.....	4.55	4.1	4.75	3.6	3.6	3.7	3.7	.....
.....	4.5	4.0	4.75	3.6	3.6	3.7	3.7	.....
.....	4.45	4.0	4.6	3.55	3.6	3.8	3.7	.....
.....	4.4	4.0	4.5	3.5	3.6	3.85	3.7	.....
.....	4.4	3.95	4.0	3.55	3.65	3.85	3.7	.....
.....	4.35	3.95	4.0	3.5	3.65	3.85	3.7	.....
.....	4.3	3.9	4.5	3.5	3.65	3.85	3.65	.....
.....	4.25	3.9	4.5	3.5	3.65	3.8	3.65	.....
.....	4.2	3.9	4.75	3.55	3.65	3.8	3.65	.....
.....	4.2	3.9	4.6	3.5	3.65	3.75	3.65	.....
.....	.....	4.0	.....	3.5	3.65	.....	3.65	.....

TE.—Ice conditions January 1 to April 7; also November 13 to December 31.

Rating table for Pembina River near Neche, N. Dak.

JANUARY 1 TO DECEMBER 31, 1904.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.50	131	6.10	442	7.70	794	10.60	1,448
4.60	147	6.20	464	7.80	816	10.80	1,494
4.70	164	6.30	486	7.90	838	11.00	1,540
4.80	181	4.40	508	8.00	860	12.00	1,770
4.90	199	6.50	530	8.20	904	13.00	2,000
5.00	217	6.60	552	8.40	948	14.00	2,230
5.10	236	7.70	574	8.60	992	15.00	2,460
5.20	255	6.80	596	8.80	1,036	16.00	2,690
5.30	275	6.90	618	9.00	1,080	17.00	2,930
5.40	295	7.00	640	9.20	1,126	18.00	3,170
5.50	315	7.10	662	9.40	1,172	19.00	3,410
5.60	336	7.20	684	9.60	1,218	20.00	3,650
5.70	357	7.30	706	9.80	1,264	21.00	3,890
5.80	378	7.40	728	10.00	1,310		
5.90	399	7.50	750	10.20	1,356		
6.00	420	7.60	772	10.40	1,402		

JANUARY 1 TO DECEMBER 31, 1906.[b]

3.00	79	4.20	231	5.40	470	7.00	800
3.10	85	4.30	250	5.50	490	7.20	842
3.20	92	4.40	270	5.60	510	7.40	884
3.30	100	4.50	290	5.70	530	7.60	926
3.40	109	4.60	310	5.80	550	7.80	968
3.50	119	4.70	330	5.90	570	8.00	1,010
3.60	130	4.80	350	6.00	590	8.20	1,052
3.70	143	4.90	370	6.20	632	8.40	1,094
3.80	158	5.00	390	6.40	674	8.60	1,136
3.90	175	5.10	410	6.60	716	8.80	1,178
4.00	193	5.20	430	6.80	758	9.00	1,220
4.10	212	5.30	450				

ais table is applicable only for open-channel conditions. It is based on discharge measurements during 1904. It is well defined between gage heights 5.0 feet and 18.0 feet.

ais table is applicable only for open-channel conditions. It is based on 9 discharge measure-s made during 1905–6. It is well defined between gage heights 3.2 feet and 6.0 feet.

Monthly discharge of Pembina River near Neche, N. Dak., for 1904–1906.[a]

[Drainage area, 2,940 square miles.[b]]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
1904.[c]						
April (8-30)[d]	3,580	217	1,920	87,600	0.653	0.56
May	3,870	1,420	2,640	162,000	.898	1.04
June	2,530	926	1,690	101,000	.575	.64
July	2,690	399	839	51,600	.285	.33
August	420	315	385	23,700	.131	.15
September	315	236	302	18,000	.103	.11
October	275	217	235	14,400	.080	.09
November (1-26)	217	131	183	9,440	.062	.06
The period				468,000		
1906.[e]						
April[f]	1,220	193	479	28,500	.163	.18
May	231	175	193	11,900	.066	.08
June	340	193	271	16,100	.092	.10
July	270	119	175	10,800	.060	.07
August	143	119	131	8,060	.045	.05
September	166	136	147	8,750	.050	.06
October	150	136	144	8,850	.049	.06
November (1-19)	136	82	111	4,180	.038	.03
The period				97,100		

[a] Monthly discharge values for 1905 published in Water-Supply Paper No. 171. Some are subject to considerable error, owing to doubtful gage heights.
[b] Revised since 1905 report.
[c] Values for 1904 are rated as follows: April, fair; May to August, excellent; September to November, good. Gage heights for September and October are doubtful; otherwise values for these months could be classed as excellent.
[d] Discharge estimated for ice period April 8 to 20.
[e] Values for 1906 are probably good. Some months might be classed as excellent, but the observer's records for June at least do not appear to be good.
[f] Discharge not corrected for ice conditions April 1 to 7.

MISCELLANEOUS MEASUREMENTS IN RED RIVER DRAINAGE BASIN.

The following miscellaneous measurements were made in 1906 at the mouth of Red Lake River at East Grand Forks, Minn:

March 23: Area of section, 627 square feet; discharge, 853 second-feet; ice 2 feet thick.

August 11: Area of section, 1,000 square feet; discharge, 1,150 second-feet.

MOUSE RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

The Mouse (or Souris) River rises in the southeastern part of the Province of Assiniboia, Canada, and flows southeastward to the western part of McHenry County, N. Dak., thence northeastward for about 30 miles to Towner, N. Dak., where it makes another turn to the north and northwest, which carries it back into Canada, to empty into Assiniboine River, a tributary of Red River. Its drainage basin, which is limited on the southwest by the Missouri Coteau and on the northeast by the Turtle Mountains, is relatively large, but its flow is small. The region through which it flows is generally gently rolling,

xcept in the immediate vicinity of the stream, where the hills are eep and high. The chief tributary of the Mouse above Minot is Des acs River.

The data collected in this basin are valuable for irrigat on pur- ses.

MOUSE RIVER NEAR FOXHOLM, N. DAK.

This station was established June 22, 1904, and was discontinued ly 31, 1906. It is located at the highway bridge 3½ miles north- st of Foxholm, N. Dak., a station on the Minneapolis, St. Paul and ult Ste. Marie Railway. The conditions at this station and the nch marks are described in Water-Supply Paper No. 171, page 42, ere are given also references to publications that contain data for evious years.

Discharge measurements of Mouse River near Foxholm, N. Dak., in 1905-6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905.					
tember 16	E. F. Chandler	31	7.4	1.50	[a] 4.9
1906.					
ril 24	E. F. Chandler	61	203	2.92	215
e 28	do	65	241	3.40	310

[a] Wading section

Daily gage height, in feet, of Mouse River near Foxholm, N. Dak., for 1906.

Day.	Mar.	Apr.	May.	June.	July.	Day.	Mar.	Apr.	May.	June.	July.
		3.4	2.5	2.7	3.3	17		3.9	2.3	4.3	2.7
		4.0	2.5	2.7	3.3	18		3.5	2.2	4.2	2.7
		5.0	2.5	2.6	3.3	19		3.4	2.1	4.0	2.6
		6.1	2.5	2.5	3.2	20		3.0	2.2	3.9	2.5
		7.8	2.4	2.5	3.3						
						21		3.2	2.2	3.9	2.5
		8.0	2.4	2.8	3.4	22		3.0	2.2	3.9	2.5
		8.6	2.4	3.0	3.45	23		3.0	2.2	3.9	2.4
		8.9	2.4	3.0	3.4	24		2.9	2.2	3.9	2.4
		8.0	2.5	3.0	3.3	25		3.0	2.2	3.8	2.3
		7.8	2.5	3.3	3.3						
						26	3.1	2.9	2.2	3.7	2.3
		6.8	2.4	3.6	3.2	27		2.8	2.2	3.5	2.2
		6.5	2.4	3.9	3.1	28		2.7	2.2	3.4	2.2
		5.6	2.4	4.7	2.9	29		2.6	2.2	3.3	2.1
		4.8	2.4	5.0	2.9	30		2.6	2.3	3.2	2.1
		4.0	2.5	5.0	2.8	31	3.9		2.5		2.0
		3.9	2.3	4.7	2.7						

OTE.—Ice conditions January 1 to March 31.

MOUSE RIVER AT MINOT, N. DAK.

This station was established May 5, 1903. It is located at the tbridge 150 feet northwest of the Great Northern Railway round- ise at Minot, N. Dak. The gage was read during 1906 by James

Cavanaugh. The conditions at this station and the bench mark described in Water-Supply Paper No. 171, page 45, where are g also references to publications that contain data for previous yea

Discharge measurements of Mouse River at Minot, N. Dak., in 1904–1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	l ch
1904.		*Feet.*	*Sq. ft.*	*Feet.*	*Se*
June 22	E. F. Chandler	88	400	6.69	
June 24	do	87	373	6.32	
July 13	R. Richards	83	291	5.16	
July 14	do	83	299	5.29	
August 12	do	77	220	4.40	
September 18	E. F. Chandler	74	220	4.30	
1905.					
March 27	Chandler and Richards	76	227	4.40	
April 27	E. F. Chandler	70	195	4.03	
May 24	do	77	223	4.56	
May 24	do	54	89	4.45	
August 18	R. Richards	48	58	4.01	
September 17	E. F. Chandler	40	23	3.86	
1906.					
April 23	E. F. Chandler	80	279	5.19	
May 29	do	76	218	4.42	
June 29	do	82	297	5.33	
September 6	do	50	57	4.00	
September 6	do	38	39	4.00	

[a] Wading section.

Daily gage height, in feet, of Mouse River at Minot, N. Dak., for 1906.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	N
1		5.0	4.9	5.4	5.2	4.5	4.0	3.8	
2		5.2	4.9	5.5	5.2	4.4	4.0	3.8	
3		5.4	4.8	5.5	5.2	4.4	4.0	3.8	
4		5.0	4.8	5.3	5.2	4.4	4.0	3.8	
5		5.2	4.8	5.2	5.1	4.4	4.0	3.8	
6		5.4	4.8	5.9	5.1	4.4	4.0	3.8	
7		5.7	4.8	5.9	5.1	4.3	4.0	3.9	
8		6.5	4.8	5.8	5.1	4.3	4.0	3.9	
9		8.0	4.7	5.8	5.1	4.3	4.0	3.9	
10		9.4	4.7	5.8	5.0	4.3	4.0	3.9	
11		9.2	4.7	5.8	5.0	4.3	4.0	3.9	
12		8.4	4.7	5.9	5.0	4.2	4.0	3.9	
13		7.3	4.7	5.9	5.0	4.2	4.0	3.9	
14		5.7	4.6	6.0	5.0	4.2	4.0	3.9	
15		5.7	4.6	6.1	5.0	4.1	4.0	3.9	
16		5.7	4.6	6.1	4.9	4.1	4.0	3.9	
17		5.7	4.6	6.0	4.9	4.1	4.0	3.9	
18		5.6	4.6	5.9	4.8	4.1	4.0	3.9	
19		5.6	4.6	5.8	4.7	4.1	4.0	3.9	...
20		5.4	4.6	5.8	4.7	4.1	3.9	3.9	...
21		5.4	4.5	5.8	4.6	4.0	3.9	3.9	...
22		5.4	4.5	5.7	4.8	4.0	3.9	3.9	...
23		5.3	4.5	5.6	4.8	4.0	3.9	3.9	...
24		5.2	4.4	5.6	4.7	4.0	3.9	3.9	...
25		5.2	4.4	5.5	4.7	4.0	3.9	3.9	...
26		5.1	4.4	5.5	4.6	4.0	3.9	3.9	...
27		5.1	4.4	5.4	4.6	4.0	3.9	3.9	...
28		5.0	4.4	5.4	4.6	4.0	3.9	3.9	...
29	4.0	5.0	4.4	5.4	4.6	4.0	3.9	3.9	...
30	4.4	5.0	4.6	5.4	4.5	4.0	3.9	3.9	...
31	4.8	.....	4.8	.....	4.5	4.0	.....	3.9	...

NOTE.—Ice conditions January 1 to April 5; also November 18 to December 31.

Rating tables for Mouse River at Minot, N. Dak.

JANUARY 1, 1904, TO DECEMBER 31, 1905.[a]

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.80	10	4.00	33	4.20	68	4.40	108
3.90	20	4.10	50	4.30	87	4.50	130

JANUARY 1 TO DECEMBER 31, 1906.[b]

3.90	18	5.00	240	6.10	499	7.40	820
4.00	31	5.10	263	6.20	523	7.60	870
4.10	46	5.20	286	6.30	547	7.80	920
4.20	66	5.30	309	6.40	571	8.00	970
4.30	87	5.40	332	6.50	595	8.20	1,020
4.40	108	5.50	355	6.60	620	8.40	1,070
4.50	130	5.60	379	6.70	645	8.60	1,120
4.60	152	5.70	403	6.80	670	8.80	1,170
4.70	174	5.80	427	6.90	695	9.00	1,220
4.80	196	5.90	451	7.00	720	9.20	1,270
4.90	218	6.00	475	7.20	770	9.40	1,320

[a] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904 and 1905. Prior to about June 20, 1904, the conditions of flow were not the same as they were after that date and any rating would be very uncertain. It is well defined between gage heights 3.85 feet and 6 feet. Above gage height 4.5 feet the table for 1906 should be used.

[b] This table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904–1906. It is not well defined above 6 feet, but is well defined below this point.

Monthly discharge of Mouse River at Minot, N. Dak., for 1904 to 1906.

[Drainage area, 8,400 square miles.]

Month.	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
1904.[a]						
July	427	152	258	15,900	0.031	0.04
August	152	108	114	7,010	.014	.02
September	108	68	81.7	4,860	.0097	.01
October	87	68	71.8	4,410	.0085	.01
November 1–25	87	50	64.3	3,190	.0077	.01
The period				35,400		
1905.[b]						
March 5–31	108	78	97.6	5,230	0.012	0.01
April	78	33	61.2	3,640	.0073	.01
May	130	33	64.1	3,940	.0076	.01
June	119	68	98.6	5,870	.012	.01
July	108	59	81.3	5,000	.0097	.01
August	108	33	68.4	4,210	.0081	.01
September	87	10	30.3	1,800	.0036	.004
October	20	10	15.5	953	.0018	.002
November 1–28	33	20	24.6	1,370	.0029	.003
The period				32,000		
1906.[c]						
April	1,320	240	454	27,000	0.054	0.06
May	218	108	159	9,780	.019	.02
June	499	286	401	23,900	.048	.05
July	286	130	214	13,200	.025	.03
August	130	31	61.9	3,810	.0074	.01
September	31	18	26.2	1,560	.0031	.003
October	18	8	16.1	990	.0019	.002
November 1–18	18	18	18.0	643	.0021	.001
The period				80,900		

[a] Gage heights for 1904 have been published in Water-Supply Paper No. 130. Discharge values for 1904 are excellent. During the spring flood the maximum discharge was estimated to be 12,000 second-feet. Discharge values for stages greater than about 10 feet are very uncertain, owing to the collection of débris below the section causing back water.

[b] Estimates of monthly discharge for 1905 have been revised; gage heights for 1905 are published in Water-Supply Paper No. 171. Discharge values for 1905 are rated as follows: March to August, excellent; September to November, fair.

[c] Discharge values for 1906 are rated as follows: April and September, good; May to August, excellent; October and November, fair.

DES LACS RIVER AT FOXHOLM, N. DAK.

This station was established June 23, 1904, and was discontinued July 31, 1906. It is located at the highway bridge at Foxholm, N. Dak., a station of the Minneapolis, St. Paul and Sault Ste. Marie Railway. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 47, where are given also references to publications that contain data for previous years.

Discharge measurements of Des Lacs River at Foxholm, N. Dak., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905. September 16	E. F. Chandler	.....	3	1.96	[a]1.6
1906. April 24	E. F. Chandler	17	8.3	2.36	[a]6.6
Do	do	17	22	2.36	6.6
June 28	do	16	6.9	2.31	[a]5.9

[a] Wading section.

Daily gage height, in feet, of Des Lacs River at Foxholm, N. Dak., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	2.0	.....	.....	8.4	2.35	3.4	2.0
2	.....	.....	.....	8.0	2.35	3.0	2.0
3	.....	2.0	2.4	7.9	2.3	3.0	1.9
4	.....	.....	.....	7.6	2.3	3.0	1.9
5	.....	.....	.....	5.0	2.3	3.7	1.9
6	.....	.....	.....	4.7	2.3	3.8	1.9
7	.....	.....	.....	3.7	2.25	3.8	1.9
8	.....	.....	.....	3.7	2.25	3.8	1.9
9	.....	.....	.....	3.6	2.0	3.7	1.8
10	.....	.....	3.0	3.55	2.0	3.7	1.8
11	.....	.....	.....	3.4	2.0	3.65	1.8
12	.....	.....	.....	3.2	2.0	3.5	1.8
13	.....	.....	.....	3.0	2.0	3.3	1.8
14	.....	.....	.....	2.8	2.1	3.0	1.8
15	.....	.....	.....	2.7	2.2	2.8	1.8
16	.....	.....	.....	2.65	2.2	2.8	1.8
17	.....	.....	.....	2.6	2.25	2.8	1.8
18	.....	.....	.....	2.6	2.25	2.8	1.8
19	.....	.....	.....	2.5	2.25	2.7	1.8
20	.....	.....	.....	2.45	2.25	2.7	1.8
21	.....	.....	.....	2.45	2.3	2.6	1.8
22	.....	.....	.....	2.4	3.0	2.6	1.8
23	.....	.....	.....	2.4	3.2	2.6	1.8
24	.....	2.0	.....	2.4	3.3	2.5	1.8
25	.....	.....	3.0	2.35	3.5	2.4	1.8
26	.....	.....	3.0	2.35	3.6	2.4	1.8
27	2.0	.....	4.0	2.35	3.6	2.3	1.8
28	.....	.....	5.3	2.4	3.7	2.0	1.8
29	.....	.....	6.0	2.4	3.7	2.0	1.8
30	.....	.....	7.0	2.35	3.7	2.0	1.8
31	.....	.....	7.5	.....	3.5	.....	1.8

NOTE.—Ice conditions January 1 to March 24; gage heights were probably to water surface in hole in ice; average thickness of ice, 1.1 feet.

Rating table for Des Lacs River at Foxholm, N. Dak., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.80	0.9	2.60	11	3.40	29	5.00	92
1.90	1.5	2.70	13	3.50	32	5.50	119
2.00	2.4	2.80	15	3.60	35	6.00	149
2.10	3.6	2.90	17	3.70	38	6.50	183
2.20	4.9	3.00	19	3.80	41	7.00	222
2.30	6.3	3.10	21	3.90	44	7.50	265
2.40	7.8	3.20	23	4.00	47	8.00	313
2.50	9.3	3.30	26	4.50	68		

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1904–1906. It is fairly well defined up to gage height 4 feet; above that the table is not well defined.

Monthly discharge of Des Lacs River at Foxholm, N. Dak., for 1906.

[Drainage area 615 square miles.]

Month	Discharge in second-feet.			Total in acre-feet.	Run-off.	
	Maximum.	Minimum.	Mean.		Sec.-ft. per sq. mile.	Depth in inches.
1 (25–31)	265	19	118	1,640	0.192	0.05
	355	7.0	59.6	3,550	.097	.11
	38	2.4	13.6	836	.022	.03
	41	2.4	19.8	1,180	.032	.04
	2.4	0.9	1.1	68	.0018	.002
The period				7,270		

E.—Values are rated as follows: March and July, fair; April to June, good.

UPPER MISSISSIPPI RIVER DRAINAGE.

GENERAL FEATURES.

ie sources of Mississippi River proper lie between latitudes 47° and north, almost exactly in the center of the continent on an east- line; its mouth is in latitude 29° north.

ie basin, which is very irregular in outline, can best be described ı oblong with the major axis, 1,700 miles in length, running south- ward from the northwestern part of Montana, through North ota, Nebraska, Missouri, and Tennessee, into the northwestern er of Alabama. On each side of this line the basin spreads out 300 to 500 miles, while on the east there is a large protuberance the general outline extending to the Allegheny Mountains. The rn outline conforms roughly to that of the Atlantic coast, the ı distance between them being about 250 miles; the eastern and ern outlines are determined by the two great mountain systems e continent, the Appalachian and the Cordilleran. The total area ıed is 1,240,000 square miles. It includes wholly or in part thirty es, besides a small area in the Dominion of Canada.

Topographically the country included within the Mississippi basin presents all varieties of form—mountain, prairie, arid plain, and alluvial bottom land teeming with vegetation, all are represented.

The drainage system may be divided into four grand sections, in the following order of size: (1) The Missouri basin, (2) the basins of Arkansas and Red rivers, (3) the Ohio basin, and (4) the basin of the upper Mississippi. The area last named, which is considered in this report, extends from the source of the river to the mouth of the Missouri; below that the stream is called the lower Mississippi.

In the northern part of Minnesota, 2,555 miles from the Gulf of Mexico, is a low plain consisting of sandy ridges of glacial origin, known as the Hauteur des Terres. It is a region of innumerable lakes, from one of the smallest of which, Lake Hernando de Soto, springs the great river. Lake Hernando de Soto is drained by a small stream flowing into Itasca Lake, which was for many years considered the source of the river. The length of Itasca Lake is about 4 miles and its breadth nowhere exceeds one-half mile. Its outlet is from 10 to 12 feet wide and from 12 to 18 inches deep.

From its utmost source to the falls of Pokegama the river flows through a drift-covered region in a valley, which is in some places narrow, in others broad and savanna-like, with many rapids in the narrower and with gentle or sluggish currents in the broader portions. In this part of its course it drains a number of lakes, among which Bemidji, Cass, Winnibigoshish, and Leech lakes are the most important. The total fall from the head of the stream to the mouth of Leech Lake River, which is nearly as large as the main stream, is about 420 feet. The first rock in place is at Pokegama Falls, and thence to the mouth of Crow Wing River, which enters from the west, the average width of the stream is 300 feet; the valley is less winding, and the current is good, with many rapids of small extent. The mouth of Crow Wing River is only 75 miles in a straight line from Lake Itasca, but the distance along the river course is 450 miles.

Below the mouth of the Crow Wing the river flows in a general southerly direction for about 475 miles. Within this stretch are several rapids, the chief being Little Falls and Sauk Rapids, and many timbered islands. The banks are abrupt, of clay or sandy loam, and lead to meadows that stand 60 feet above the river. At the falls of St. Anthony the river pitches down a vertical fall and rapid amounting to 75 feet in half a mile, and in so doing leaves the prairie and clay banks for a channel that lies between rocky bluffs of limestone and sandstone, which continue for many miles down the river, gradually increasing to a height of 500 feet as the bed sinks below the general prairie level. The sides of the bluffs are not vertical, bare surfaces of rock, but are composed of easily eroded stone and drift, which form well-wooded or grassy slopes.

sota River, formerly called St. Peters River, enters the Mis- ıbout 10 miles below St. Anthony Falls, and below its mouth dth of the main stream averages 1,000 feet. From this point ıouth of the Missouri the general characteristics of the river same—a broad placid stream with innumerable islands, the idth of the valley averaging 1 mile. In many places, espe- ıere tributaries enter, there are fertile flats between the river bluffs. Fifty-five miles below the mouth of the Minnesota Pepin, an expansion of the river apparently caused by the quantities of sand brought down by the Chippewa.

o places exceptions occur to the otherwise placid character of r. At Rock Island, Ill., 384 miles from St. Paul, there are y which the river falls 20.4 feet in 12 miles, and at Keokuk, 9 miles from St. Paul, is the foot of the Des Moines Rapids, a distance of 11 miles the river falls 21.85 feet.

ırge tributaries below the Minnesota are the St. Croix, Chip- Visconsin, Rock, and Illinois from the east and the Iowa and nes from the west.

MISSISSIPPI RIVER PROPER.

MISSISSIPPI RIVER NEAR SAUK RAPIDS, MINN.

tation was established April 23, 1903, and was discontinued 1, 1906, owing to the construction of a dam 2 miles below. ıted about 1½ miles south of Watab station, on the Northern Railway, about 5 miles north of Sauk Rapids and 7 miles north oud. The conditions at this station and the bench marks are d in Water-Supply Paper No. 171, page 51, where are given rences to publications that contain data for previous years.

measurements of Mississippi River near Sauk Rapids, Minn., in 1903-1905.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
W. R. Hoag	580	4,080	13.22	7,910
E. C. Murphy	615	3,350	11.85	5,020
Murphy and Stockman	615	3,340	11.85	5,040
L. R. Stockman	631	5,680	15.60	17,400
E. Johnson jr	515	2,200	[a] 11.55	2,470
E. F. Chandler	585	4,170	14.26	12,300
do	577	3,790	13.31	8,020
R. Richards	557	2,680	11.38	4,740
do	572	3,400	12.76	[b] 4,340
do	561	2,860	11.77	[c] 4,800
E. F. Chandler	578	3,820	13.75	9,350
R. Richards	560	1,810	[d] 11.29	2,620
do	582	3,890	13.60	8,520
do	580	3,690	12.88	6,800

[a] Ice 1.7 feet thick, and anchor ice. Gage height to bottom of ice, 10.20 feet.
[b] Log jam 600 feet below.
[c] Partial log jam 600 feet below.
[d] Ice 1.5 feet thick. Gage height to bottom of ice, 9.9 feet.

Daily gage height, in feet, of Mississippi River near Sauk Rapids, Minn., for 1906.

Day.	Jan.	Feb.	Mar.	Day.	Jan.	Feb.	Ma
3		12.95	13.25	20	12.95		
8	12.9			24		13.35	
10		12.95	13.15	25		13.35	
14	12.95			27	12.95		
17		13.0	12.85	31			
18		13.0					

NOTE.—No ice notes given by observer; ice conditions not known. The river, however, was kn to be open December 26, 1905.

Rating table for Mississippi River near Sauk Rapids, Minn., for 1903–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
10.80	3,480	12.10	5,450	13.40	8,310	15.40	16,370
10.90	3,610	12.20	5,640	13.50	8,590	15.60	17,440
11.00	3,740	12.30	5,830	13.60	8,880	15.80	18,550
11.10	3,880	12.40	6,020	13.70	9,180	16.00	19,700
11.20	4,020	12.50	6,220	13.80	9,490	16.20	20,890
11.30	4,160	12.60	6,420	13.90	9,810	16.40	22,120
11.40	4,300	12.70	6,630	14.00	10,150	16.60	23,390
11.50	4,450	12.80	6,840	14.20	10,870	16.80	24,700
11.60	4,600	12.90	7,060	14.40	11,660	17.00	26,050
11.70	4,760	13.00	7,290	14.60	12,510	18.00	33,200
11.80	4,920	13.10	7,530	14.80	13,400	19.00	40,990
11.90	5,090	13.20	7,780	15.00	14,350	20.00	49,290
12.00	5,270	13.30	8,040	15.20	15,340		

NOTE.—The above table is applicable only for open-channel conditions. It is based on disch measurements made during 1903–1905. It is well defined between gage heights 11.5 feet and 16.0 fe

Monthly discharge of Mississippi River near Sauk Rapids, Minn., for 1903–1905.[a]

[Drainage area, 12,400 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Dep inc
1903.[b]					
May 3–31	21,200	10,200	13,600	1.10	
June	9,650	4,300	5,750	.464	
July	8,450	4,230	6,090	.491	
August	7,830	4,450	6,000	.484	
September	18,300	4,520	10,300	.831	
October	27,100	7,290	16,000	1.29	
November 1–14; 27–30[c]	9,840	5,360	6,720	.542	
December			3,740	.302	
1904.[d]					
January			2,340	.189	
February			2,070	.167	
March			2,620	.211	
April 11–30[e]	19,100	10,300	12,600	1.02	
May	12,500	7,660	10,400	.839	
June	13,200	5,540	8,700	.702	
July	8,040	3,950	5,910	.477	

[a] It is possible that log jams below this station may have affected results over relatively short peri Ice estimates are based on the observer's notes on ice statements and on two measurements made u ice conditions.

[b] Gage heights for 1903 have been published in Water-Supply Paper No. 98. Discharge values rated as follows: May to July, good; August to November, excellent; remainder of the year, appr mate. Ice conditions December 1 to 31.

[c] No gage-height records November 15 to 26.

[d] Gage heights for 1904 have been published in Water-Supply Paper No. 128. Discharge values for are rated as follows: April to November, excellent; remainder of the year, approximate. Ice co tions as follows: January 1 to April 10, December 1 to December 31.

[e] Ice gorge April 1 to 10.

Monthly discharge of Mississippi River near Sauk Rapids, Minn., for 1903—Cont'd.

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. miles.	Depth in inches.
1904.					
gust	5,000	3,680	4,240	0.342	0.39
tember	5,640	4,020	4,570	.369	.41
ober	10,300	5,270	8,280	.668	.77
vember	7,290	3,740	5,400	.435	.49
ember	.....	.....	3,050	.246	.28
1905.[b]					
uary	.....	.....	2,620	.211	.24
ruary	.....	.....	2,500	.202	.21
rch	4,680	.....	3,180	.256	.30
il	11,300	4,020	6,570	.530	.59
y	22,800	4,380	14,000	1.13	1.30
e	35,500	7,530	21,000	1.69	1.89
y	51,000	10,900	28,700	2.31	2.66
gust	15,800	9,980	12,900	1.04	1.20
tember	10,900	7,000	9,320	.752	.84
ober	7,660	5,270	6,700	.540	.62
vember	7,290	5,270	6,000	.484	.54
ember	.....	.....	7,190	.580	.67
The year	51,000	.....	10,100	.810	11.06

Log jam August 20 to September 3; discharge values corrected.
Gage heights for 1905 have been published in Water-Supply Paper No. 171. Discharge values are ed as follows: May to November, excellent; April, fair; remainder of the year, approximate. Ice ditions as follows: January 1 to March 29, December 1 to 31.

MISSISSIPPI RIVER AT ANOKA, MINN.

This station was established May 8, 1905. It is located at a high-y bridge three-fourths mile southwest of Anoka. The station s temporarily discontinued from July 20, 1906, to August 10, 1906. e bench mark is a chiseled cross on the face of the stone in the lower ng wall of the left abutment of the bridge, the second stone of the ttom course. The mark is about 5 feet from the lower end of the ng wall; elevation, 11.19 feet above the gage datum. The condi-ns at this station are described in Water-Supply Paper No. 171, ge 52.

Discharge measurements of Mississippi River at Anoka, Minn., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Dis-charge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ember 16	R. Richards	764	4,600	2.36	12,200
ember 3	E. F. Chandler	756	4,000	1.77	9,650
mber 27	R. Richards	755	3,700	2.86	[a] 7,910
1906.					
l 12	Horton and Brennan	776	6,740	5.20	24,000
25	M. S. Brennan	781	6,250	4.50	22,200

e measurement made at section 600 feet below bridge. Lower surface of ice at gage height, 1.90 average thickness of ice, 1.06 feet.

Daily gage height, in feet, of Mississippi River at Anoka, Minn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	2.3	4.25	6.0	4.8	.....	2.8	3.5	.....	6.3
2	.....	.....	.....	2.4	4.25	5.8	4.85	.....	2.8	3.35	.....	9.4
3	.....	.....	2.0	3.4	4.25	5.6	5.05	.....	2.8	3.35	.....	10.4
4	.....	2.3	.....	5.4	4.25	6.0	5.0	.....	2.8	3.2	.....	10.0
5	2.3	.....	.....	5.5	3.8	6.0	5.05	.....	2.7	3.0	.....	9.5
6	.....	.....	.....	4.5	3.8	6.45	4.9	.....	2.65	3.0	.....	9.5
7	.....	.....	.....	5.6	3.8	6.8	4.85	.....	2.65	2.8	2.8	9.3
8	.....	.....	.....	6.0	3.8	7.0	5.0	.....	2.6	2.8	2.8	9.3
9	.....	.....	.....	5.5	3.8	7.2	5.0	.....	2.3	2.6	2.75	.....
10	.....	2.5	.....	5.4	4.0	7.35	4.8	1.5	2.0	2.3	2.7	.....
11	.....	.....	2.4	5.5	4.2	7.25	4.8	1.5	1.5	2.3	2.7	.....
12	.....	.....	.....	5.3	4.25	7.2	4.25	1.5	1.5	2.2	2.7	.....
13	2.1	.....	.....	5.3	4.2	6.8	4.2	1.55	1.5	2.2	2.6	.....
14	.....	.....	.....	5.4	4.2	6.5	4.0	1.65	1.5	2.2	2.5	.....
15	.....	.....	.....	5.8	3.8	6.1	3.8	1.8	1.8	1.8	2.4	6.8
16	.....	.....	.....	5.97	3.4	5.6	3.55	1.8	1.8	1.8	2.4	.....
17	.....	.....	.....	5.97	3.4	5.15	3.5	1.8	1.8	1.8	2.35	.....
18	.....	.....	2.75	5.85	3.25	4.9	3.0	1.8	1.8	1.95	2.1	.....
19	.....	2.3	.....	5.8	3.2	4.85	2.8	1.8	1.85	2.0	1.9	.....
20	.....	.....	.....	5.6	3.4	4.85	2.55	1.85	1.85	2.0	2.8	.....
21	.....	.....	.....	5.4	3.5	4.5	.....	1.85	1.9	2.05	3.8	.....
22	2.2	.....	.....	5.4	3.55	4.5	.....	1.85	2.0	1.9	6.1	6.2
23	.....	.....	.....	5.1	.....	4.8	.....	1.85	2.0	1.8	6.9	.....
24	.....	2.3	2.7	4.8	.....	4.8	.....	1.85	2.35	1.8	7.6	.....
25	.....	.....	.....	4.25	4.5	4.7	.....	1.85	2.5	1.8	8.8	.....
26	.....	.....	.....	4.25	.....	4.55	.....	2.0	2.8	2.3	5.3	.....
27	2.2	.....	.....	4.25	4.5	4.55	.....	2.1	2.85	2.5	3.3	.....
28	.....	.....	.....	4.3	5.4	4.8	.....	2.5	3.0	2.8	2.8	.....
29	.....	.....	.....	4.8	6.0	4.85	.....	2.6	3.0	3.0	2.8	5.4
30	.....	.....	.....	4.25	6.0	4.85	.....	2.8	3.0	.....	3.5	.....
31	.....	.....	.....	.....	6.0	.....	.....	2.8	.....	.....	.....	.....

NOTE.—The river was frozen from January 1 to March 31; gage heights are to water surface in a hole in the ice, except during February, when the river at the gage was frozen to the bottom, and gage heights are to top of ice. The following comparative readings were taken:

Comparative ice and water gage heights of Mississippi River at Anoka, Minn.

Date.	Water surface.	Top of ice.	Thickness of ice at gage.
January 5	2.3	2.5	1.2
January 13	2.1	2.3	1.2
January 22	2.2	2.3	1.4
January 27	2.2	2.3	1.5
March 3	2.0	2.0	1.65
March 11	2.4	2.5	1.65
March 18	2.75	2.85	1.3
March 24	2.7	2.85	1.2

Ice conditions caused backwater November 20 to 26; also during the first part of December. River frozen entirely across December 15.

MISCELLANEOUS MEASUREMENT OF MISSISSIPPI RIVER.

The following miscellaneous measurement was made of the Mississippi River from the Chicago Great Western Railroad bridge at St. Paul, Minn.:

October 31, 1905: Width, 894 feet; area, 7,640 square feet; gage height, 5.54 feet; discharge, 16,100 second-feet.

CROW RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Crow River is formed by the junction of North and South forks. Below the junction the river is only 18 miles in length, while North and South forks are 96 and 80 miles long, respectively. With the exception of the Crow Wing this river is the largest tributary of the Mississippi above the Minnesota.

The basin of the Crow lies wholly within the State of Minnesota. It consists, principally, of rolling prairie, interspersed with groves of hard-wood timber, and is largely cultivated. The numerous lakes within its limits, some of which are 4 or 5 square miles in area, help to make the flow of the river uniform.

The stream is of value for water power, especially North Fork and the main stream below the junction.

CROW RIVER NEAR DAYTON, MINN.

This station was established April 13, 1906, and was discontinued July 21, 1906. It is located at the highway bridge at Berning's mill, about 13½ miles by road from Anoka, Minn., and about 7 miles up the valley from Dayton, at the mouth of the river.

The channel is straight for about 200 feet above and below the station. Berning's mill and dam are about 200 feet above the bridge. The mill uses only a small amount of the total flow. Water flows over the dam at all times. There is one channel at all stages. Both banks are of medium height and are but rarely or never overflowed. The bed of the stream is of coarse gravel and is permanent. The current is swift.

Discharge measurements are made from the lower side of the single-span highway bridge. The initial point for soundings is the inner face of the left cylinder pier.

The gage, which was read during 1906 by Joseph Berning, is a vertical staff attached to a pile near the left end of the bridge on the upstream side. The bench mark is a point between two chisel drafts on top of the casing of the upstream pier at the left end of the bridge. An arrow chiseled on the upstream side of the pier points toward the mark; elevation, 15.66 feet above the gage datum.

The high water of 1890, the highest for fifty years, corresponded to a gage height of 15.5 feet.

Discharge measurements of Crow River near Dayton, Minn., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
1905. November 2	E. F. Chandler	161	509	3.79	570
1906. April 13	Horton and Brennan	168	907	6.53	2,010
May 26	M. S. Brennan	215	2,030	12.00	8,050

Daily gage height, in feet, of Crow River near Dayton, Minn., for 1906.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1		5.4	13.8	8.0	17	7.5	6.0	9.4	6.2
2		5.6	13.3	8.0	18	7.2	6.1	9.0	6.1
3		5.8	12.8	7.9	19	7.0	6.1	8.7	6.0
4		5.9	12.9	7.9	20	6.8	6.0	8.7	5.9
5		5.8	12.5	7.9	21	6.6	6.9	8.8	5.7
6		5.7	12.6	7.8	22	6.3	9.7	8.9	.....
7		5.5	12.8	7.6	23	6.1	10.7	8.9	.....
8		5.4	12.7	7.4	24	5.9	11.6	8.7	.....
9		5.3	12.5	7.3	25	5.7	11.9	8.6	.....
10		5.2	12.3	7.1	26	5.5	12.1	8.5	.....
11		5.1	11.9	6.9	27	5.4	12.9	8.3	.....
12		5.0	11.4	6.7	28	5.3	13.3	8.3	.....
13	6.5	5.4	10.9	6.5	29	5.3	13.6	8.3	.....
14	7.1	5.6	10.6	6.4	30	5.3	13.8	8.1	.....
15	7.7	5.8	10.1	6.3	31		13.9		.....
16	7.7	5.9	9.8	6.3					

Rating table for Crow River near Dayton, Minn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
5.00	1,080	6.30	1,855	7.60	2,845	9.80	5,110
5.10	1,130	6.40	1,925	7.70	2,930	10.00	5,350
5.20	1,185	6.50	1,995	7.80	3,020	10.20	5,600
5.30	1,240	6.60	2,065	7.90	3,110	10.40	5,855
5.40	1,295	6.70	2,135	8.00	3,200	10.60	6,115
5.50	1,350	6.80	2,210	8.20	3,390	10.80	6,380
5.60	1,410	6.90	2,285	8.40	3,585	11.00	6,650
5.70	1,470	7.00	2,360	8.60	3,785	12.00	8,050
5.80	1,530	7.10	2,435	8.80	3,990	13.00	9,550
5.90	1,595	7.20	2,515	9.00	4,200	14.00	11,140
6.00	1,660	7.30	2,595	9.20	4,420		
6.10	1,725	7.40	2,675	9.40	4,645		
6.20	1,790	7.50	2,760	9.60	4,875		

NOTE.—The above table is based on three discharge measurements made during 1905–6. Its accuracy is wholly dependent on the accuracy of the three measurements which define it; an error in any one would involve a corresponding error in the rating at the stage of the measurement in question. The general form of the curve, however, appears to be very good.

Monthly discharge of Crow River near Dayton, Minn., for 1906.

[Drainage area, 2,540 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April 13-30	2,930	1,240	1,960	0.772	0.32
May	11,000	1,080	3,790	1.49	1.72
June	10,800	3,300	6,170	2.43	2.71
July 1-21	3,200	1,470	2,360	.929	.73

NOTE.—Values for 1906 are probably excellent. See rating table footnote.

RUM RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Rum River, so named on account of the color of its water, starts from the southwestern part of Mille Lacs, in east-central Minnesota, flows southward, and enters the east side of the Mississippi at Anoka.

below the mouth of Crow River. Its basin is about 80 miles . averages not over 19 miles in width. The large body of its head serves an important part in maintaining the flow ›w water. The stream flows between banks of clay or mud, re it crosses the ridge of granite which produces Sauk Rapids ississippi there is a slight fall over rock in place.

River has been largely used for lumbering, and its small tribu- ve many dams, built for holding and flushing logs into the er. The data collected in this basin are valuable for water- ırposes.

RUM RIVER NEAR ANOKA, MINN.

tation was established May 8, 1905, and was discontinued 1906. It is located at the highway bridge 6½ miles due Anoka, the distance by road being 7½ miles. The condi- this station and the bench marks are described in Water- 'aper No. 171, page 54.

ischarge measurements of Rum River near Anoka, Minn., in 1905–6.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
R. Richards	148	877	12.65	987
E. F. Chandler	149	939	13.16	1,190
R. Richards	145	488	13.26	[a] 765
Horton and Brennan	200	1,950	17.66	4,480
M. S. Brennan	191	1,290	14.18	1,810

ırement; gage height to under side of ice 12.26 feet; ice about 1 foot thick. The discharge per cent of the open-channel rating for gage height 13.26 feet.

ıily gage height, in feet, of Rum River near Anoka, Minn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
				15.2	13.8	16.2	13.9
				15.3	13.6	16.45	14.0
		13.25	13.85	15.4	13.4	16.3	13.9
				15.6	13.65	15.95	13.8
				15.9	13.8	15.9	13.65
	13.1			16.6	13.8	15.6	13.5
				17.55	13.7	15.7	13.0
				18.0	13.85	16.15	13.0
				18.45	13.75	16.95	12.9
		13.15	13.75	18.55	13.7	18.98	12.8
				18.2	13.45	20.45	12.75
				17.9	13.4	21.3	12.75
	13.25			17.5	13.7	21.15	12.7
				17.6	14.0	20.15	12.7
				17.6	13.9	19.0	12.65
				17.5	13.7	18.25	12.6
		13.25	13.65	17.4	13.65	16.85	12.65
				17.35	13.6	16.25	12.6
				17.45	13.45	15.5	12.5
	13.1			17.4	13.4	14.6	12.45
				17.1	13.5	13.85	12.4
				16.8	13.8	13.7	
				16.2	13.8	13.8	
		13.45	13.4	15.5	13.8	13.75	
				15.1	14.0	13.8	

Daily gage height, in feet, of Rum River near Anoka, Minn., for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
26				14.5	14.2	13.95	
27	13.35			14.4	15.0	14.3	
28				14.15	15.45	14.5	
29				13.95	15.4	14.35	
30				13.9	15.6	13.85	
31			15.1		16.0		

NOTE.—The river was frozen January 1 to March 31; gage heights were to the water surface in a hole in the ice. The following comparative readings were taken:

Comparative water and ice gage heights on Rum River near Anoka, Minn.

Date.	Water surface.	Top of ice.	Thickness of ice.
January 6	13.1	13.15	1.1
January 13	13.25	13.35	1.2
January 20	13.1	13.2	1.2
January 27	13.35	13.4	1.4
February 3	13.25	13.3	1.4
February 10	13.15	13.2	1.5
February 17	13.25	13.3	1.6
February 24	13.45	13.5	1.5
March 3	13.85	13.9	1.5
March 10	13.75	13.8	1.4
March 17	13.65	13.7	1.5
March 24	13.4	13.5	1.6

Rating table for Rum River near Anoka, Minn., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
11.00	470	12.30	830	13.60	1,450	15.80	3,000
11.10	490	12.40	870	13.70	1,510	16.00	3,150
11.20	510	12.50	910	13.80	1,570	16.20	3,300
11.30	535	12.60	950	13.90	1,630	16.40	3,460
11.40	560	12.70	990	14.00	1,690	16.60	3,620
11.50	585	12.80	1,030	14.20	1,830	16.80	3,780
11.60	610	12.90	1,070	14.40	1,970	17.00	3,940
11.70	640	13.00	1,120	14.60	2,110	18.00	4,750
11.80	670	13.10	1,170	14.80	2,250	19.00	5,600
11.90	700	13.20	1,220	15.00	2,400	20.00	6,450
12.00	730	13.30	1,270	15.20	2,550	21.00	7,300
12.10	760	13.40	1,330	15.40	2,700	22.00	8,150
12.20	795	13.50	1,390	15.60	2,850		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 8 discharge measurements made during 1905–6. It is well defined between gage heights 11.7 feet and 14.5 feet. The table has been extended beyond these limits, being based on one measurement at gage height 17.66 feet.

Monthly discharge of Rum River near Anoka, Minn., for 1906.

[Drainage area, 1,430 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft per sq. mile.	Depth in inches.
January			672	0.470	0.54
February			612	.428	.45
March			786	.550	.63
April	5,210	1,630	3,550	2.48	2.77
May	3,150	1,330	1,720	1.20	1.38
June	7,550	1,510	3,430	2.40	2.68
July 1–21	1,690	870	1,150	.804	.63

NOTE.—Values are rated as follows: January to March, approximate; April to July, excellent. *Flow under ice cover estimated.*

MINNESOTA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Minnesota River rises in Bigstone Lake, which forms part of the ›oundary between South Dakota and Minnesota, flows southeast-ward to the city of Mankato, in the northern part of Blue Earth 'ounty, where it makes an abrupt turn to the north, and continues in northerly and northeasterly direction until it enters the Mississippi t a point midway between Minneapolis and St. Paul. The course f this river is generally marked by wide bottom lands. It has a uggish current, affording few opportunities for the development of ater power.

MINNESOTA RIVER NEAR MANKATO, MINN.

This station was established May 20, 1903, and was discontinued ıly 21, 1906. It is located at Sibley Park, 1 mile below the high-ay and railroad bridges across Blue Earth River and 1½ miles above ıe city bridge in Mankato. Blue Earth River joins the Minnesota ›out 500 feet above the station. The conditions at this station and ıe bench marks are described in Water-Supply Paper No. 171, ıge 56, where are given also references to publications that contain ıta for previous years.

Discharge measurements of Minnesota River near Mankato, Minn., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
›vember 1	E. F. Chandler	298	815	2.69	1,240
›cember 29	R. Richards	297	811	3.70	[a] 1,070
1906.					
›ril 11	Horton and Brennan	310	1,890	7.59	6,020
›y 24	M. S. Brennan	308	1,730	5.81	4,300

[a] Ice measurement; gage height to under side of ice, 3 feet; ice thickness, about 0.8 foot. The dis-ırge was about 55 per cent of the discharge as given by the open-channel rating for gage height 3.70 t.

Daily gage height, in feet, of Minnesota River near Mankato, Minn., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
	3.5	3.2	4.8	7.1	6.3	8.2	7.55
	3.5	3.3	4.8	7.6	6.45	8.3	7.4
	3.5	3.3	4.95	8.1	6.55	8.3	7.45
	3.5	3.0	4.85	7.6	6.6	8.3	7.4
	3.5	3.2	4.8	7.4	6.55	8.5	7.3
	3.5	3.1	4.9	7.1	6.45	8.7	7.2
	3.45	3.1	4.8	7.0	6.3	8.8	7.1
	3.45	3.05	4.9	6.8	6.25	8.95	7.0
	3.45	3.0	5.4	7.1	6.15	9.1	6.85
	3.45	3.0	5.4	7.4	6.0	9.2	6.75
	3.4	2.95	5.2	8.0	5.85	9.2	6.6
	3.4	2.9	4.9	7.45	5.75	9.15	6.4
	3.4	2.9	4.7	7.8	5.65	9.05	6.45
	3.4	2.9	4.5	8.85	5.55	8.95	6.0
	3.35	2.9	4.4	8.9	5.4	8.9	5.85

Daily gage height, in feet, of Minnesota River near Mankato, Minn., for 1906—Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
16	3.4	2.9	4.15	9.2	5.3	8.8	5.6
17	3.4	2.9	3.95	9.3	5.3	8.7	5.4
18	3.4	2.9	3.6	9.25	5.5	8.55	5.3
19	3.35	2.9	3.6	9.1	5.55	8.65	5.5
20	3.35	3.1	3.6	8.85	5.55	8.6	5.0
21	3.35	3.2	3.3	8.6	5.35	8.45	4.8
22	3.35	3.4	3.3	8.3	5.75	8.4	.....
23	3.3	4.0	3.4	7.9	5.55	8.4	.....
24	3.25	4.45	3.1	7.5	5.7	8.3	.....
25	3.2	4.4	3.1	7.3	5.75	8.2	.....
26	3.05	4.4	3.25	7.05	5.8	8.1	.....
27	3.0	4.5	4.3	6.8	6.15	8.1	.....
28	3.0	4.6	4.25	6.55	6.55	8.1	.....
29	3.05	.....	4.65	6.45	7.0	8.1	.....
30	3.2	.....	5.1	6.3	7.6	8.1	.....
31	3.2	.....	5.45	.....	8.0	.....	.....

NOTE. Ice conditions January 1 to April 2.

Rating table for Minnesota River near Mankato, Minn., for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.80	3,090	5.80	4,270	6.80	5,610	7.80	7,010
4.90	3,200	5.90	4,400	6.90	5,750	7.90	7,150
5.00	3,310	6.00	4,530	7.00	5,890	8.00	7,300
5.10	3,430	6.10	4,660	7.10	6,030	8.20	7,600
5.20	3,550	6.20	4,790	7.20	6,170	8.40	7,900
5.30	3,670	6.30	4,920	7.30	6,310	8.60	8,200
5.40	3,790	6.40	5,050	7.40	6,450	8.80	8,500
5.50	3,910	6.50	5,190	7.50	6,590	9.00	8,800
5.60	4,030	6.60	5,330	7.60	6,730	9.20	9,100
5.70	4,150	6.70	5,470	7.70	6,870		

NOTE. The above table is applicable only for open-channel conditions. It is based upon 6 discharge measurements made during 1905 and 1906. It is well defined between gage heights 2.8 feet and 8.6 feet. On account of changes at gaging section, measurements of previous years were not applicable. For low stages this table gives over 25 per cent increase over the 1903 table.

Monthly discharge of Minnesota River near Mankato, Minn., for 1906.

[Drainage area, 13,400 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	9,250	4,920	6,980	0.521	0.58
May	7,300	3,670	4,650	.347	.40
June	9,100	7,450	8,160	.609	.68
July 1-21	6,660	3,090	5,120	.382	.30

NOTE. Values for 1906 are excellent.

CHIPPEWA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Chippewa River rises in the southeastern part of Ashland County, Wis., flows southwestward, and unites with the Mississippi near Wabash, Minn. Its principal tributary is Flambeau River, which enters from the east, in Gates County.

A. BRUNETT FALLS, CHIPPEWA RIVER, WISCONSIN.

B. LOWER PITCH OF BIG FALLS, FLAMBEAU RIVER, WISCONSIN

ıe Chippewa is one of the most important power streams in Wis-
in. There are some 33 feet of fall at Chippewa Falls. Between
alls and the mouth of the Flambeau, 43 miles, there is a fall of
'eet, 116 feet of this being concentrated in five falls and rapids.
large flow of the Chippewa and the use of storage reservoirs to
tain the summer flow gives the stream unusual value as a source
›wer.

ıe of the best powers on Chippewa River, and one most cheaply
loped, is found at Brunett Falls (Pl. III, *A*), in sec. 18, T. 31 N.,
W. It belongs to Cornell University, which also owns the adja-
land as well as the water rights. The best location for the dam
d be about 650 feet above the foot of the rapids, where a 35-foot
would create a large reservoir, backing the water up to the rapids
olcombe, 5½ miles above. The river at the dam site is narrow
›r 80 feet), while the banks are high granite ledges; the plans are
to contemplate a dam 200 feet long. A steel wagon bridge has
ıtly been built across the river immediately below.

CHIPPEWA RIVER AT CHIPPEWA FALLS, WIS.

ıe United States Weather Bureau has maintained a station at
point since 1900. June 1, 1906, the Geological Survey began
.ng discharge measurements at the highway bridge, 2,500 feet
v the dam at Chippewa Falls.

ıe channel is straight for 500 feet above the station and for a con-
able distance below. The left bank is low and liable to overflow;
ight bank is formed by a railroad embankment, which is under
r in high floods. The bed of the stream is gravel and sand and
›bably permanent. The current is swift.

scharge measurements are made from the lower side of the steel
way bridge. The initial point for soundings is the inner face of
ight abutment at the downstream side.

ıe gage is an iron staff attached to the downstream face of the
pier from the right bank. The gage readings for 1906 were fur-
›d by N. O. Swift, the United States Weather Bureau observer
ıippewa Falls.

ıe river stage during the "sawing season" fluctuates very rapidly
nes, due to the storage of water at Holcombe by the lumber com-
. This reservoir is opened two or three times a week to flood
to the sawmill.

measurement was made at this station on June 1, 1906, by M. S.
nan, giving the following results:

lth, 721 feet; area, 4,700 square feet; gage height, 6.70 feet; discharge, 18,000 sec-
›et.

Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for 1906.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		5.0	4.0	8.2	2.0	1.7	2.3	1.5	3.9	3.
2		4.3	4.0	2.3	1.8	1.5	1.4	1.8	3.6	2.
3		5.5	4.2	5.0	2.4	1.0	1.5	3.0	3.4	2.4
4		6.3	4.4	4.0	2.3	1.4	4.6	1.8	3.2	2.2
5		8.0	5.0	3.1	2.0	1.3	1.8	1.5	3.1	2.0
6		7.9	5.1	3.6	2.4	1.5	1.5	1.3	3.0	1.9
7		7.8	5.4	3.1	2.3	3.0	1.8	1.2	3.0	1.8
8		8.0	4.5	5.1	1.0	1.9	1.5	1.0	3.0	1.8
9		9.0	2.5	6.0	1.5	2.3	1.4	1.2	3.8	1.8
10		9.8	2.3	5.6	2.0	2.4	2.4	1.2	3.8	1.8
11		9.9	2.0	5.1	2.3	1.5	1.5	3.3	3.6	1.8
12		9.5	1.8	5.0	1.5	1.3	1.6	1.3	3.4	1.9
13		9.6	2.3	4.0	1.6	1.9	1.7	1.3	3.3	2.0
14		10.0	2.9	3.9	1.5	1.2	1.8	1.4	3.2	2.0
15		11.5	5.8	3.5	2.0	1.7	3.0	1.5	2.7	2.0
16		11.4	5.0	3.3	2.4	1.4	3.2	1.7	2.6	2.0
17		10.5	2.3	2.3	2.7	1.3	6.5	1.8	2.5	2.0
18		9.3	4.3	3.5	1.8	1.4	3.6	1.8	2.8	2.0
19		8.8	4.4	1.8	2.0	1.3	2.6	1.5	3.3	2.0
20		7.4	2.9	1.5	1.9	1.2	2.8	1.5	3.0	2.0
21		8.0	3.0	1.9	1.7	1.5	2.5	1.7	2.8	2.0
22		7.8	1.8	2.0	1.1	1.8	2.8	2.0	2.7	2.0
23		7.4	4.0	2.4	1.3	4.0	3.0	2.3	2.5	2.0
24		7.0	5.7	1.0	1.0	1.8	6.8	2.4	2.2	2.0
25		7.3	2.4	1.5	1.8	4.5	3.8	3.0	2.0	2.0
26		6.3	3.8	2.5	1.5	2.8	3.5	5.1	2.2	2.0
27		5.6	5.5	2.7	1.6	4.2	2.5	5.0	2.5	2.0
28		5.0	6.6	2.8	1.5	1.8	2.3	5.0	3.0	2.0
29		4.4	6.8	3.3	1.2	2.7	2.5	4.9	3.3	2.0
30		4.2	5.9	1.0	1.0	1.5	2.4	4.6	3.4	2.0
31	3.6	.....	5.7	.....	1.5	1.3	.....	3.8	.....	2.0

NOTE.—There were ice conditions January 1 to March 31; also December 13 to 31.

CHIPPEWA RIVER NEAR EAU CLAIRE, WIS.

This station was established November 13, 1902. It is located 2 miles below Eau Claire, at a suburb known as Shawtown. The river stage during the "sawing season" fluctuates very rapidly at times, owing to the lumber company at Chippewa Falls storing water about 30 miles above the falls in a reservoir which is opened two or three times a week to flood logs to the sawmill. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 59, where are given also references to publications that contain data for previous years.

Discharge measurements of Chippewa River near Eau Claire, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 25	M. S. Brennan	332	2,770	4.82	[a] 2,760
April 25	do	425	4,870	9.45	17,100
June 2	do	355	3,650	6.52	7,990

[a] Ice measurement; river partly open. Gage height to bottom of ice, 3.92 feet; ice 1 to 1.2 feet thick. Discharge was about 75 per cent of the open-channel rating for gage height, 4.82 feet.

aily gage height, in feet, of Chippewa River near Eau Claire, Wis., for 1906.

y.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
.....	4.62	4.91	5.73	8.38	7.66	10.30	5.88	5.72	8.95	5.32	7.29	6.91
.....	.....	.....	.....	9.57	7.58	6.22	8.44	5.06	4.76	5.28	7.04	6.36
.....	.....	.....	.....	10.90	7.79	9.00	6.64	4.70	5.23	6.00	7.19	5.81
.....	.....	.....	.....	12.27	8.20	7.13	6.12	4.34	9.55	5.40	6.99	6.02
.....	.....	4.95	5.45	13.48	8.76	6.20	5.42	3.52	5.82	5.18	6.74	6.04
.....	.....	.....	.....	12.46	8.52	7.18	5.76	4.29	4.83	4.85	6.57	5.56
.....	.....	.....	.....	12.25	9.00	6.80	7.52	7.92	5.36	4.26	6.55	5.25
.....	.....	.....	5.15	12.35	9.00	9.65	4.35	5.51	4.98	4.24	6.76	5.08
.....	.....	5.05	.....	12.90	6.78	9.82	5.20	5.27	4.48	4.52	6.78	5.07
.....	.....	.....	.....	13.55	7.16	9.24	5.22	7.87	6.25	4.36	7.20	4.86
.....	.....	.....	.....	13.50	7.44	8.00	6.18	5.52	5.35	6.40	6.80	5.28
.....	.....	5.19	5.21	12.99	6.86	8.92	5.32	3.68	4.79	5.34	6.92	5.24
.....	.....	.....	.....	12.95	6.60	7.58	4.98	6.62	4.82	5.04	6.65	5.56
.....	4.25	.....	.....	13.73	10.06	7.50	5.13	5.05	5.04	3.55	6.54	5.46
.....	.....	5.00	4.96	14.86	10.26	6.84	5.25	4.62	6.12	4.82	5.95	5.75
.....	.....	.....	.....	14.71	8.77	6.74	5.58	4.51	6.50	4.90	6.55	5.12
.....	.....	.....	.....	13.55	7.39	6.42	6.29	4.52	7.78	4.64	6.20	5.65
.....	.....	.....	.....	12.62	7.95	7.70	5.28	6.81	6.84	5.12	6.40	5.42
.....	.....	5.24	4.95	12.08	8.26	5.22	5.60	5.08	6.59	4.45	6.76	5.48
.....	4.21	.....	.....	11.60	6.60	4.90	5.72	4.03	6.33	5.39	6.54	5.06
.....	.....	.....	.....	11.36	7.66	5.02	5.78	4.56	5.66	4.84	6.68	5.04
.....	.....	5.09	.....	11.20	6.08	5.60	4.20	4.77	6.25	5.59	5.76	5.14
.....	.....	.....	.....	10.41	6.82	8.51	4.32	8.73	6.45	5.88	6.10	4.76
.....	5.13	.....	.....	10.02	10.06	5.26	5.04	5.28	7.68	7.02	5.98	5.41
.....	4.82	.....	5.42	9.62	6.75	5.04	6.69	10.20	6.70	6.28	5.22	4.56
.....	.....	5.23	4.88	9.28	8.16	6.11	5.32	5.32	6.34	8.51	6.15	4.58
.....	.....	.....	5.32	8.76	9.82	6.41	4.77	8.33	5.95	9.10	6.57	4.89
.....	.....	.....	5.42	8.45	10.94	6.86	4.88	5.54	5.62	8.54	7.18	4.81
.....	4.65	.....	5.28	8.07	11.05	8.87	3.56	9.33	6.22	8.32	7.43	4.82
.....	.....	.....	5.50	7.36	9.82	5.54	4.72	5.59	5.38	7.84	7.34	4.38
.....	.....	.....	7.47	.....	9.45	.....	4.52	5.50	.....	7.60	.....	4.82

—River frozen January 1 to March 30. From January 1 to about February 20 and March 25 to was an open channel west of the gage which varied in width during this period from 50 to 180 ie river was open about 150 feet below the gage January 1 to February 15 and about 50 feet ie gage throughout the ice period. Fluctuations of daily gage heights during the open period almost wholly to "flooding for logs" by lumbermen. The following comparative readings ten:

Comparative water and ice gage readings of Chippewa River near Eau Claire, Wis.

Date.	Water surface.	Top of of ice.	Thickness of ice.
20	4.2	4.8	1.0
24	.....	.....	1.1
29	4.65	4.95	1.1
y 1	4.9	5.0	1.1
y 5	4.95	5.15	1.2
y 9	5.05	5.25	1.4
y 12	5.2	5.4	1.6
y 15	5.0	5.05	1.7
y 19	5.25	5.35	1.9
y 22	5.1	5.2	1.5
y 26	5.25	5.45	1.3
.....	5.75	5.8	.9
.....	5.45	5.5	1.0
.....	5.15	5.25	.8
?	.....	.....	1.5
5	4.95	5.05	.9
?	4.95	5.05	.9

Rating table for Chippewa River near Eau Claire, Wis., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.50	1,040	4.90	3,820	6.30	7,360	8.40	13,600
3.60	1,210	5.00	4,050	6.40	7,640	8.60	14,240
3.70	1,390	5.10	4,280	6.50	7,920	8.80	14,890
3.80	1,570	5.20	4,520	6.60	8,200	9.00	15,550
3.90	1,760	5.30	4,760	6.70	8,480	9.20	16,210
4.00	1,950	5.40	5,000	6.80	8,770	9.40	16,890
4.10	2,140	5.50	5,250	6.90	9,060	9.60	17,570
4.20	2,340	5.60	5,500	7.00	9,350	9.80	18,250
4.30	2,540	5.70	5,760	7.20	9,930	10.00	18,950
4.40	2,740	5.80	6,020	7.40	10,530	11.00	22,550
4.50	2,950	5.90	6,280	7.60	11,130	12.00	26,350
4.60	3,160	6.00	6,550	7.80	11,730	13.00	30,350
4.70	3,380	6.10	6,820	8.00	12,350	14.00	34,500
4.80	3,600	6.20	7,090	8.20	12,970	15.00	38,750

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1902-1906. It is well defined between gage heights 4 feet and 15 feet.

Monthly discharge of Chippewa River near Eau Claire, Wis., for 1906.

[Drainage area, 6,740 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft per sq. mile.	Depth in inches.
April	38,100	10,400	24,900	3.69	4.12
May	22,700	6,770	13,500	2.00	2.31
June	20,000	3,820	10,000	1.48	1.65
July	13,700	1,140	5,350	.794	.92
August	19,600	1,330	6,220	.923	1.06
September	17,400	2,910	6,970	1.03	1.15
October	15,900	1,120	6,270	.930	1.07
November	10,600	4,570	8,310	1.23	1.37
December	9,090	2,700	4,810	.714	[illegible]

NOTE.—Values for 1906 are excellent. During January, February, and March the flow probably seldom exceeded 3,000 second-feet and may have attained a minimum of 1,500 second-feet, or less.

FLAMBEAU RIVER NEAR LADYSMITH, WIS.

This station was established February 13, 1903. It is located three-fourths mile south of the Minneapolis, St. Paul and Sault Ste. Marie Railway station, three-fourths mile south of Ladysmith, and one-half mile below the dam of the Menasha Pulp Company. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 62, where are given also references to publications that contain data for previous years.

No powers have been developed on Flambeau River for 70 miles above Ladysmith, but a fall of 353 feet in this distance insures many opportunities for development. At two localities—Little Falls and Big Falls—the power possibilities are of special importance. The first is in the NW. ¼ sec. 21, T. 35 N., R. 5 W., and is owned by A. J. McGilvary and B. D. Viles, of Chippewa Falls. A 15-foot dam at the head of the first rapids would give a head of about 25 feet at the foot of the rapids a short distance below. Big Falls, owned by

ıe John Heim Company, of Tony, Wis., is 6 miles above Little alls, in sec. 35, T. 36 N., R. 5 W. There is a descent of 25 feet ere in a short distance, concentrated in three pitches, a view of one f which is shown in Pl. III, B.

Discharge measurements of Flambeau River near Ladysmith, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ıuary 26	M. S. Brennan	344	501	16.13	[a] 632
pril 16	Horton and Brennan	380	2,630	20.74	10,800

[a] Entirely frozen over. Gage height to bottom of ice, 15.33 feet; thickness of ice varied from 0.8 to 2 et; water surface 0.3 to 0.5 foot below ice surface. The discharge was about 40 per cent of the open-hannel rating at gage height 16.13 feet.

Daily gage height, in feet, of Flambeau River near Ladysmith, Wis., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	16.72	.....	.....	16.92	17.82	17.35	16.80	15.20	16.15	16.15	20.25	19.55
2	16.90	.....	.....	16.92	18.05	17.30	16.92	15.75	16.25	15.70	20.25	19.00
3	16.85	.....	.....	17.00	17.65	17.15	17.10	16.20	16.12	15.80	20.30	.....
4	17.35	16.80	17.10	17.85	18.30	16.90	16.80	15.25	16.10	15.40	20.50	.....
5	16.65	.....	.....	18.15	18.60	16.82	16.82	15.70	16.05	16.00	20.10	.....
6	17.10	.....	.....	18.20	18.55	17.15	16.20	17.15	16.10	15.20	20.55	.....
7	.....	.....	.....	18.05	18.20	17.78	16.35	17.30	16.35	15.80	20.05	.....
8	.....	.....	.....	17.45	17.78	18.25	16.10	16.95	15.50	14.90	19.55	.....
9	.....	.....	.....	18.15	17.52	17.90	16.35	16.30	15.55	15.75	19.40	.....
1	.....	.....	.....	18.38	17.40	18.20	16.38	16.20	15.70	15.85	19.90	.....
...	.....	17.10	15.60	18.30	17.18	17.72	16.40	16.35	15.60	15.72	19.85	.....
...	.....	.....	.....	19.05	17.10	17.45	16.52	16.20	15.65	15.70	17.05	.....
...	.....	.....	.....	19.65	17.10	17.40	16.60	16.15	16.65	15.70	16.45	.....
...	16.70	.....	.....	20.50	17.02	16.85	16.35	16.00	17.12	15.65	16.35	.....
...	.....	.....	.....	20.72	17.25	16.80	16.20	16.00	17.15	15.60	16.50	.....
...	.....	.....	.....	20.65	17.00	16.65	16.40	15.80	17.08	15.75	16.70	.....
...	.....	.....	17.10	20.48	17.50	16.55	16.30	15.90	17.10	15.65	16.75	.....
...	.....	.....	.....	20.35	16.68	16.30	16.20	15.70	17.12	17.05	16.70	.....
...	.....	17.00	.....	20.40	16.68	16.10	16.10	15.35	17.10	[a] 18.50	17.00	.....
...	.....	.....	.....	20.40	16.85	16.10	15.95	15.60	16.78	19.75	16.60	.....
...	16.30	.....	.....	20.40	16.65	16.32	16.60	16.45	16.28	19.65	16.30	.....
...	.....	.....	.....	20.10	16.90	16.60	15.88	16.75	17.02	19.70	16.55	.....
...	.....	.....	.....	19.75	16.95	16.50	15.75	16.80	17.08	19.5	18.05	.....
...	.....	.....	.....	19.45	17.32	16.75	15.68	17.00	16.15	19.75	19.30	.....
...	.....	17.4	16.60	19.00	17.32	16.58	16.00	16.65	16.65	20.20	19.35	.....
...	.....	.....	.....	18.70	17.50	16.60	15.55	17.05	16.58	24.40	19.30	.....
...	.....	.....	.....	18.45	17.80	16.62	15.70	16.55	16.25	20.50	19.45	.....
...	16.70	.....	.....	18.05	17.70	16.50	15.65	16.45	16.40	20.45	19.45	.....
...	.....	.....	.....	18.05	17.38	16.82	15.75	16.35	16.20	20.20	19.50	.....
...	.....	.....	.....	17.90	17.80	17.40	15.55	16.20	16.55	20.50	19.55	.....
...	.....	.....	.....	.....	17.50	.....	15.00	16.50	.....	20.40	.....	.....

[a] October 18 a dam below the station was closed, raising the water at the section.

NOTE.—River frozen January 6 to April 4, approximately; also December 3 to 31. During January e average ice thickness was about 1 foot, while during February and March it was 1.6 feet.

Rating table for Flambeau River near Ladysmith, Wis., from January 1, 1906, to October 17, 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
14.90	535	16.20	1,735	17.50	3,700	19.40	7,710
15.00	600	16.30	1,855	17.60	3,890	19.60	8,170
15.10	670	16.40	1,980	17.70	4,090	19.80	8,630
15.20	745	16.50	2,110	17.80	4,300	20.00	9,090
15.30	825	16.60	2,245	17.90	4,510	20.20	9,550
15.40	910	16.70	2,385	18.00	4,720	20.40	10,030
15.50	1,000	16.80	2,530	18.20	5,140	20.60	10,510
15.60	1,090	16.90	2,680	18.40	5,560	20.80	11,000
15.70	1,185	17.00	2,835	18.60	5,980	21.00	11,500
15.80	1,285	17.10	2,995	18.80	6,400	22.00	14,100
15.90	1,390	17.20	3,160	19.00	6,820	23.00	16,800
16.00	1,500	17.30	3,330	19.20	7,260	24.00	19,600
16.10	1,615	17.40	3,510				

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906. It is well defined between gage heights 15.5 feet and 21 feet. Owing to the closure of a dam below the section the table is not applicable after October 17, 1906.

Monthly discharge of Flambeau River near Ladysmith, Wis., for 1906.

[Drainage area, 2,120 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April (5–30)	10,800	3,600	7,310	3.45	3.34
May	5,980	2,320	3,680	1.74	2.01
June	5,240	1,620	2,900	1.37	1.53
July	3,000	600	1,770	.835	.96
August	3,330	745	1,860	.877	1.01
September	3,080	1,000	2,730	1.29	1.44
October (1–17)	1,340	910	1,170	.552	.35

NOTE.—Values for 1906 are probably excellent. During the frozen period the discharge probably seldom exceeded 1,500 second-feet and may have declined to a minimum of 500 or less. See ice measurement.

FLAMBEAU RIVER SURVEY.

In order to point out the power possibilities along the Flambeau River a survey was made during 1906 from Flambeau to a point near the western border of Lac Du Flambeau Indian Reservation; the section from the mouth to Flambeau had been surveyed by the Geological Survey in 1902. From the data collected sheets have been prepared showing a profile of the water surface, a plan of the river, contour along the bank, and prominent natural or artificial features. The results of this survey have been published on separate sheets and may be had on application to the Director of the Geological Survey.

BLACK RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Black River rises in the southeastern part of Taylor County, Wis., at an elevation between 1,300 and 1,400 feet above tide, flows in a general southwesterly direction for a distance of 128 miles, and joins

Mississippi about 10 miles above the town of La Crosse. Its in, wedged in between that of the Wisconsin on the east and the ppewa on the west, is long and narrow, being at one point rcely more than 3 miles wide. The total area drained is 2,272 are miles.

'he surface of the basin is gently rolling or level, and the country ut the lower part of the river is well settled and under cultiva- ı. The southern portion of the pine region crosses the basin ween 60 and 80 miles from the mouth of the river, and all of the er half of the area is forested. There are a few lakes at the upper ers, but the basin is not well supplied with natural reservoirs.

'he river has a total fall of about 750 feet between source and ıth, or over 4.5 feet a mile. At Black River Falls there are y heavy rapids for a short distance, over hard granite rock. The utaries, which are characterized by many rapids and moderate s, are all small streams of little importance, though they furnish ver for a few small mills.

BLACK RIVER SURVEY.

In order to point out the power possibilities along Black River a vey was made during 1906 from Black River Falls to Wisconsin ntral Railway crossing. From the data collected on this survey ets have been prepared showing a profile of the water surface, a n of the river, contour along the bank, and prominent natural or ificial features. The results of this survey have been published separate sheets and may be had upon application to the Director the Geological Survey.

BLACK RIVER AT NEILLSVILLE, WIS.

This station was established April 7, 1905. It is located at the er highway bridge at Neillsville, Wis., about 40 rods below the icago, St. Paul, Minneapolis and Omaha Railway bridge. The ıditions at this station and the bench marks are described in ıter-Supply Paper No. 171, page 65.

Discharge measurements of Black River at Neillsville, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
ıary 25	M. S. Brennan	147	198	4.30	*a* 152
l 24	do	165	484	4.75	819
3	do	160	436	4.46	752

ntirely frozen over; gage height given to water surface; ice 1.3 feet thick. The discharge was r cent of the open-channel rating for gage height 4.30 feet.

Daily gage height, in feet, of Black River at Neillsville, Wis., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.5	4.1	5.1	9.4	4.2	5.1	3.7	3.2	3.2	2.7	4.2	5.5
2	3.3	4.1	5.0	11.8	4.6	4.8	3.5	3.0	4.5	2.9	3.9	5.2
3	3.4	4.1	5.2	12.0	5.0	4.3	3.9	2.8	4.5	2.7	3.8	4.9
4	3.5	4.1	5.0	11.6	5.2	4.0	4.2	2.6	4.7	2.7	3.9	4.5
5	3.4	4.0	4.9	11.3	5.1	4.2	4.0	2.8	4.5	2.7	3.8	4.2
6	3.4	4.0	4.9	11.0	4.7	6.3	3.6	3.0	3.0	2.5	3.7	4.8
7	3.5	4.0	4.8	10.6	4.4	6.9	3.3	2.9	3.8	2.5	3.7	4.2
8	3.5	3.9	4.8	11.4	4.2	6.6	3.1	2.8	3.4	2.5	3.7	4.5
9	3.4	3.9	5.3	10.7	4.3	5.9	3.0	2.4	2.9	2.5	3.6	4.7
10	3.5	3.8	5.1	10.0	4.3	5.4	3.1	2.4	3.0	2.5	3.7	4.8
11	3.5	3.8	4.9	8.9	4.1	4.6	3.0	2.4	3.0	2.7	3.6	4.8
12	3.5	3.8	4.9	8.7	3.9	4.1	3.0	2.5	3.0	2.4	3.6	4.8
13	3.5	4.0	4.8	8.5	6.9	3.8	2.8	2.4	3.0	2.4	3.3	4.6
14	3.5	3.9	4.7	8.8	7.3	3.5	2.8	2.4	2.9	2.4	3.2	4.3
15	3.6	3.9	4.6	8.5	6.6	3.3	2.8	2.3	2.9	2.4	3.3	4.3
16	3.6	3.9	4.5	7.6	5.9	3.2	2.7	2.3	3.3	2.5	3.2	4.5
17	3.7	3.8	4.5	6.7	5.4	3.1	2.7	2.4	3.3	2.5	4.1	4.6
18	3.8	3.9	4.4	6.2	4.9	3.0	2.6	2.4	3.4	2.7	5.1	4.6
19	3.8	3.9	4.3	6.0	4.5	2.9	2.7	2.3	3.3	2.7	4.8	4.5
20	3.8	4.1	4.3	6.0	4.1	3.0	2.7	2.3	3.2	3.0	4.6	.....
21	4.0	4.2	4.4	5.8	4.0	3.1	2.6	2.2	3.2	3.5	4.4	.....
22	4.0	4.3	4.3	5.4	4.0	3.6	2.6	2.6	3.1	3.4	3.7	.....
23	4.0	4.4	4.2	4.9	4.1	3.9	2.2	3.0	3.0	3.4	3.8	.....
24	4.0	4.6	4.1	4.8	4.2	4.1	2.1	3.8	3.2	3.7	3.6	.....
25	4.0	4.8	4.2	4.4	6.0	3.9	2.1	4.1	3.2	4.2	3.8	.....
26	4.0	4.9	5.1	4.4	5.9	3.7	2.4	4.4	3.1	5.2	5.5	.....
27	4.1	5.1	6.0	4.3	9.3	3.9	2.4	4.3	3.0	5.2	6.7	.....
28	4.1	5.1	6.6	4.2	8.3	4.1	2.5	4.1	3.0	4.9	6.6	.....
29	4.1	.....	7.2	4.1	7.2	4.2	2.4	3.9	2.9	4.7	6.3	.....
30	4.1	.....	[a] 11.5	4.2	6.5	3.9	4.0	3.7	2.8	4.5	6.2	.....
31	4.1	.....	8.5	.....	5.8	.....	3.7	3.4	.....	4.2	.....	.....

[a] Ice jam.

NOTE.—Ice conditions January 1 to March 30 and December 20 to 31.

Rating table for Black River at Neillsville, Wis., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.10	20	3.60	338	5.10	1,185	7.20	2,850
2.20	26	3.70	379	5.20	1,250	7.40	3,050
2.30	34	3.80	424	5.30	1,315	7.60	3,250
2.40	44	3.90	473	5.40	1,385	7.80	3,460
2.50	56	4.00	525	5.50	1,455	8.00	3,680
2.60	70	4.10	579	5.60	1,525	8.20	3,900
2.70	86	4.20	635	5.70	1,600	8.40	4,120
2.80	105	4.30	692	5.80	1,675	8.60	4,340
2.90	126	4.40	750	5.90	1,750	8.80	4,580
3.00	150	4.50	810	6.00	1,825	9.00	4,820
3.10	177	4.60	870	6.20	1,985	10.00	6,020
3.20	205	4.70	930	6.40	2,145	11.00	7,300
3.30	235	4.80	990	6.60	2,310	12.00	8,700
3.40	267	4.90	1,055	6.80	2,480		
3.50	301	5.00	1,120	7.00	2,660		

NOTE. The above table is applicable only for open-channel conditions. It is based upon 8 discharge measurements made during 1905 and 1906. It is well defined between gage heights 3.3 feet and 7.7 feet. Beyond these limits the discharge is only approximate.

Monthly discharge of Black River at Neillsville, Wis., for 1906.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
April	8,700	579	3,860
May	5,180	473	1,450
June	2,570	126	730
July	635	20	184
August	750	26	188
September	930	105	274
October	1,250	44	298
November	2,400	205	733
December (1-19)	1,460	424	874

NOTE.—Values for 1906 are good, except July and August, which are fair. During the frozen period the discharge probably seldom exceeded 500 second-feet and attained a minimum of at least 150, and probably much less.

WISCONSIN RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Wisconsin River, the largest stream in the State of Wisconsin, rises in Lac Vieux Desert, a sheet of water about 10 square miles in area which lies directly on the line separating the upper peninsula of Michigan from Wisconsin, and enters the Mississippi just below Prairie du Chien. The river flows southward for 300 miles to the city of Portage; it then turns sharply and flows west and southwest for the remainder of the distance to its mouth. Its drainage basin, 12,280 square miles in extent, has an average width of about 50 miles and is 225 miles long. From source to mouth the distance by water is approximately 400 miles. The stream lies for the most part in the eastern half of the basin, and below the bend at Portage it flows within about 10 miles of its southern edge.

The country drained is rolling, and in places decided ridges break the surface. In the headwater region are many lakes and tamarack swamps, and all the way down to Portage there is more or less swamp and between the ridges. The wooded (pine) country extends from the Michigan boundary line down to within 40 miles, by river, of the city of Portage. Below that point the pine disappears, and a semi-prairie region gradually takes the place of the woods. In the southern part of the basin the Baraboo ranges of quartzite pass east and west from 400 to 700 feet above the surrounding country, and the bluffs along the lower river, especially on the south side, form prominent ramparts to the valley. Back from these the land is level or undulating.

Owing to the form of the basin and the position of the river in it there are no very large tributaries. The wooded character of all the upper portion of the drainage area aids in maintaining the flow of the stream during the dry and cold seasons and makes the Wisconsin one of the most uniform in flow of all the large tributaries of the Mississippi.

The elevation of the headwaters is 1,532 feet above the sea, and that of the mouth about 600 feet. Hence in a course estimated to be 407 miles the river falls 932 feet, or about 2.29 feet per mile. The most rapid part is in the upper portion of the stream, and here are the available water powers. At the rapids the river flows over a rocky bed, but at intermediate places the bed is largely made up of sand, gravel, and bowlders.

In the 53 miles between the foot of the upper dam at Merrill and the foot of the Rhinelander dam the river has a natural descent of 277 feet, an average of 5.2 feet per mile. In this stretch, besides several other fine powers, are included Grandfather Rapids, the largest water power on the river, developed or undeveloped. These rapids begin in the NE. ¼ sec. 30, T. 33 N., R. 6 E., and extend to the SW. ¼ sec. 31, a distance of 1½ miles, and are the most noted rapids on the river. A view of them is shown in Pl. IV, *A*. The descent in this distance is 89½ feet. The high bank and the bed of the river are in hard rock. For nearly thirty years the Wisconsin River Logging Association has maintained three logging dams on these rapids. It is probable that the cheapest method of developing this power would be to construct three dams of 30 feet head each, and that the power could be best employed by paper mills. The site is about midway in the 20-mile stretch from Merrill to Tomahawk.

About 1.5 miles above Grandfather Rapids are some small rapids where an 8.9-foot dam would back the water to the foot of Grandmother Rapids.

WISCONSIN RIVER SURVEY.

In order to point out the power possibilities along the Wisconsin River, a survey was made during 1906 between Sauk City and Dekorra and between Lewiston Station and Jersey City. From the data collected sheets have been prepared, showing a profile of the water surface, a plan of the river, contour along the bank, and prominent natural or artificial features. The results of this survey have been published on separate sheets and may be had upon application to the Director of the Geological Survey.

EAU CLAIRE RIVER SURVEY.

In order to point out the power possibilities along the Eau Claire River, a survey was made during 1906 from the mouth to Johnson. From the data collected sheets have been prepared, showing a profile of the water surface, a plan of the river, contour along the bank, and prominent natural or artificial features. The results of this survey have been published on separate sheets and may be had upon application to the Director of the Geological Survey.

WISCONSIN RIVER NEAR RHINELANDER, WIS.

This station was established December 1, 1905. It is located about 8 miles southwest of Rhinelander, Wis., at the highway bridge about 0 feet below Forbes and Wixson's dam and power station.

A GRANDFATHER RAPIDS, WISCONSIN RIVER, WISCONSIN.

B EVAPORATION STATION, MADISON, WIS.

The channel is straight for 400 feet above and below the bridge. he banks are of medium height, but do not overflow. The bed of ie river is rocky and is permanent; the current is swift.

Discharge measurements are made from the lower side of the two-pan highway bridge; the initial point for soundings is the right end f the downstream railing of the bridge.

A standard chain gage, which was read during 1906 by E. H. Miller nd Charles Hagen, is attached to the upstream side of the bridge. ength of chain, 18.97 feet. The bench mark is the head of the right olt on the upstream side of the top of the right upstream cylinder ier. It is marked with white paint and the letters "B. M."; elevaion, 13.96 feet above the gage datum. The reference point is the enter of pulley of gage; elevation, 17.12 feet above the gage datum.

Discharge measurements of Wisconsin River near Rhinelander in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 27	M. S. Brennan	209	473	2.71	[a] 1,040
April 17	Horton and Brennan	215	822	4.25	2,580
June 12	M. S. Brennan	216	656	3.60	2,050

[a] Narrow strip of ice along shore.

Daily gage height, in feet, of Wisconsin River near Rhinelander, Wis., for 1905–6.

Day.	1905.	1906.											
	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	3.0	2.6	2.8	2.8	3.4	3.1	4.1	2.8	3.1	2.4	2.95	3.1
2	2.4	3.0	2.6	2.5	3.0	3.3	3.2	3.1	2.7	2.4	2.5	3.1	2.65
3	2.25	2.75	3.0	2.95	3.0	3.3	2.8	4.0	3.1	3.0	2.5	3.0	3.0
4	2.4	2.9	2.7	2.95	2.95	3.9	3.1	3.6	3.15	2.9	2.5	2.1	3.1
5	3.0	2.75	2.8	2.4	3.0	3.9	3.2	2.1	1.4	3.3	2.8	2.9	2.8
6	3.1	2.75	2.9	2.9	2.8	4.2	3.6	3.1	3.1	2.6	2.8	3.1	2.3
7	3.05	2.6	3.1	2.8	3.0	3.4	4.3	3.3	2.9	2.5	1.8	2.9	3.0
8	3.1	3.0	2.9	2.4	3.3	3.5	3.9	2.5	3.0	2.8	2.9	2.9	2.65
9	3.2	2.8	2.9	2.7	3.1	3.6	4.3	2.7	3.0	1.7	3.0	2.8	2.9
10	3.0	2.7	2.55	2.8	3.2	3.4	4.4	2.8	2.8	2.1	3.0	2.5	2.7
11	3.0	2.9	2.6	2.6	3.9	3.5	3.5	3.0	2.5	2.5	2.8	2.1	2.9
12	3.2	2.8	2.1	2.6	4.3	3.6	3.6	3.15	2.7	2.7	2.9	2.4	2.7
13	3.1	2.7	2.8	3.0	4.0	3.3	3.5	2.5	2.9	2.6	2.9	2.9	2.85
14	3.2	2.5	2.7	2.95	4.2	3.2	3.4	2.8	2.9	2.4	2.2	2.4	2.8
15	3.0	2.7	2.6	3.0	4.3	2.6	3.2	2.6	2.9	2.8	2.5	2.6	2.8
16	3.05	2.7	2.65	2.7	3.8	3.1	3.2	2.85	2.8	2.0	2.8	2.45	2.6
17	2.85	2.9	2.7	2.75	4.4	3.2	2.8	2.8	2.8	2.4	3.15	2.5	2.7
18	2.9	2.7	2.7	2.5	4.1	3.3	2.4	2.8	2.7	2.5	3.0	1.8	2.3
19	3.1	2.8	2.4	2.7	4.5	3.3	3.0	2.85	1.8	2.5	3.0	2.4	2.9
20	3.1	2.75	2.4	2.8	4.6	3.1	3.1	2.8	2.7	2.5	3.1	2.8	2.5
21	2.7	2.8	2.45	2.8	4.4	3.2	3.2	2.3	2.7	2.7	2.9	2.3	2.7
22	2.95	2.75	2.5	2.7	4.7	3.1	3.5	2.0	2.9	2.6	2.6	2.2	2.7
23	3.3	2.75	2.4	2.5	4.0	3.1	3.3	2.2	3.0	1.8	3.0	2.1	2.5
24	2.9	2.9	3.2	2.7	3.9	3.0	2.5	2.9	3.6	2.3	2.9	2.2	2.5
25	3.0	2.8	2.7	2.9	3.6	2.95	3.1	3.0	3.1	2.4	3.0	1.4	2.9
26	2.7	2.8	2.9	3.0	3.5	3.2	3.2	3.1	2.5	2.45	3.1	2.4	2.6
27	2.9	2.75	2.9	2.95	3.5	1.8	3.7	2.9	2.8	2.4	3.1	2.8	2.3
28	2.7	2.6	3.0	2.8	3.4	3.1	3.1	3.0	3.2	2.4	3.1	3.0	2.8
29	2.6	2.9	.....	2.5	3.9	3.05	3.7	2.0	3.25	2.6	3.1	3.2	2.8
30	2.8	3.0	.....	2.3	3.6	3.6	3.7	2.9	3.0	2.6	3.1	3.1	2.2
31	2.6	2.7	.....	2.7	.....	3.7	.....	2.6	2.9	.....	3.0	.....	2.7

NOTE.—No ice record.

WISCONSIN RIVER AT MERRILL, WIS.

This station was established November 17, 1902. It is located on the highway bridge in the city of Merrill, three blocks from the Lincoln County court-house, one-half mile from the Chicago, Milwaukee and St. Paul Railway station, and 1,000 feet below the dam of the electric-power house. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 68, where are given also references to publications that contain data for previous years.

Discharge measurements of Wisconsin River at Merrill, Wis., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 24[a]	M. S. Brennan	331	1,090	5.92	1,980
April 23[b]	do	334	2,300	8.26	10,000

[a] Partly frozen; discharge about 50 per cent of open channel rating. [b] Logs running.

Daily gage height, in feet, of Wisconsin River, at Merrill, Wis., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.6	5.5	5.75	5.65	7.35	6.55	6.65	4.45	5.85	3.5	6.05	5.9
2	5.75	5.9	5.7	5.7	7.65	6.65	6.45	4.6	6.45	4.5	5.7	5.8
3	6.45	5.5	5.45	6.15	7.8	6.45	7.0	5.2	6.4	4.8	6.0	5.6
4	6.3	5.9	5.2	6.7	7.6	5.85	7.2	5.3	6.35	5.0	5.95	5.5
5	6.85	5.6	5.75	7.65	7.75	7.35	6.85	5.45	6.15	4.75	5.0	5.7
6	5.95	5.65	6.0	7.45	7.75	8.15	6.55	5.05	5.9	5.05	5.75	5.6
7	5.8	5.5	5.65	7.6	7.3	8.25	6.95	5.05	5.6	4.85	5.45	5.45
8	5.7	5.8	5.9	7.5	6.8	7.95	7.5	5.1	5.3	4.45	5.85	5.3
9	5.5	5.6	5.8	8.0	6.45	8.1	5.7	5.15	5.0	4.75	5.65	5.3
10	5.55	5.9	5.4	9.75	6.75	7.75	5.75	5.6	5.0	4.15	5.25	4.8
11	6.05	5.8	4.95	9.8	6.95	7.5	5.7	5.5	4.8	5.3	5.35	5.5
12	5.95	5.65	6.0	9.75	7.0	7.5	5.8	5.9	4.7	5.25	4.9	5.4
13	5.75	5.65	5.6	10.0	6.6	6.7	5.65	4.8	5.55	5.3	5.2	5.7
14	5.8	5.55	6.15	10.05	6.65	6.4	5.8	5.2	5.6	5.0	5.0	5.0
15	5.65	5.7	5.8	9.95	6.65	6.1	5.5	5.05	5.65	4.35	5.65	5.45
16	5.95	5.25	5.9	9.45	6.7	6.1	4.55	5.6	5.7	4.85	5.3	5.45
17	6.35	5.05	6.05	9.2	6.95	5.7	5.6	5.15	3.75	5.15	5.45	5.4
18	6.15	5.1	5.75	9.25	6.4	5.55	5.25	5.2	5.05	5.3	5.15	5.35
19	5.65	5.2	5.6	9.5	6.55	5.85	5.25	5.05	5.45	5.95	5.45	5.5
20	5.65	5.3	5.6	9.55	6.8	6.4	5.15	3.3	5.4	5.1	5.55	5.1
21	5.9	5.75	5.9	9.4	7.2	6.65	5.05	5.6	5.4	5.9	5.75	5.4
22	5.75	5.85	5.75	9.15	6.95	5.8	4.15	6.55	5.75	5.6	5.7	4.95
23	6.0	5.8	5.8	8.85	6.6	5.75	3.5	7.55	5.5	5.6	5.25	5.0
24	5.6	5.65	5.85	8.25	6.55	6.15	5.5	7.15	4.45	5.85	5.1	4.85
25	5.2	5.95	5.6	8.25	6.95	6.7	5.55	6.8	5.55	6.95	5.45	5.35
26	5.5	5.7	5.95	8.0	7.05	6.2	5.15	8.45	5.1	6.65	5.4	5.4
27	5.9	5.5	6.15	7.55	6.4	6.1	4.35	7.75	5.35	6.5	5.5	5.6
28	5.6	5.95	5.7	7.3	6.8	6.05	4.95	7.25	5.0	6.15	6.1	5.7
29	5.7	.....	5.35	6.95	6.55	5.9	5.15	7.1	5.15	6.0	6.3	5.5
30	5.55	.....	5.8	7.4	7.2	6.45	3.8	5.95	4.7	6.1	6.3	5.65
31	5.85	.....	5.65	.....	6.95	.....	5.0	5.45	.....	6.1	.....	4.8

NOTE.—No ice record by observer. Probably ice conditions during January to March and December

Rating table for Wisconsin River at Merrill, Wis., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
3.50	790	4.80	1,950	6.10	4,210	7.80	8,480
3.60	840	4.90	2,090	6.20	4,420	8.00	9,070
3.70	895	5.00	2,230	6.30	4,640	8.20	9,680
3.80	955	5.10	2,380	6.40	4,860	8.40	10,310
3.90	1,020	5.20	2,540	6.50	5,090	8.60	10,960
4.00	1,090	5.30	2,700	6.60	5,320	8.80	11,620
4.10	1,170	5.40	2,870	6.70	5,560	9.00	12,300
4.20	1,260	5.50	3,040	6.80	5,800	9.20	12,980
4.30	1,360	5.60	3,220	6.90	6,050	9.40	13,680
4.40	1,460	5.70	3,410	7.00	6,300	9.60	14,380
4.50	1,570	5.80	3,600	7.20	6,820	9.80	15,080
4.60	1,690	5.90	3,800	7.40	7,360	10.00	15,800
4.70	1,820	6.00	4,000	7.60	7,910		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904–1906. It is fairly well defined between gage heights 5 feet and 8.5 feet. Below gage height 4.5 feet it is only approximate.

Monthly discharge of Wisconsin River at Merrill, Wis., for 1905–6.

[Drainage area, 2,630 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
1905.					
April	13,000	2,960	7,170	2.73	3.05
May	8,480	2,460	5,640	2.14	2.47
June	18,000	3,040	9,920	3.77	4.21
July	9,680	1,360	5,290	2.01	2.32
August	5,920	1,950	4,090	1.56	1.80
September	7,220	3,900	5,010	1.91	2.13
October	5,920	1,360	4,410	1.68	1.94
November	4,640	1,950	3,150	1.20	1.34
1906.					
April	16,000	3,320	10,400	3.95	4.41
May	8,480	4,860	6,230	2.37	2.73
June	9,840	3,130	5,510	2.09	2.33
July	7,630	790	3,450	1.31	1.51
August	10,500	700	3,770	1.43	1.65
September	4,980	925	2,950	1.12	1.25
October	6,180	790	2,900	1.10	1.27
November	4,640	2,090	3,170	1.21	1.35

NOTE.—Gage heights for 1905 are published in Water-Supply Paper No. 171. Discharge values for 1905 and 1906 are excellent, although logging may affect the results to a slight degree. Ice conditions assumed January, February, March, and December. Discharge as given by the measurements on January 24, 1906, is about 50 per cent of the open-channel rating.

WISCONSIN RIVER NEAR NECEDAH, WIS.

This station was established December 2, 1902. It is located on the highway toll bridge 3 miles east of Necedah, Wis., and 3 miles from the Chicago, Milwaukee and St. Paul and the Chicago and Northwestern railway stations. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 70, where are given also references to publications that contain data for previous years.

Daily gage height, in feet, of Wisconsin River near Necedah, Wis., for 1906.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		8.5	7.6	8.0	8.2	4.8	6.7	4.8	6.65	8.5
2		9.85	7.7	7.8	7.65	4.8	6.8	5.2	6.4	7.9
3		9.5	7.65	7.5	7.4	4.8	5.9	4.8	6.7	7.0
4		9.8	7.5	7.4	7.85	4.9	6.0	4.6	6.7	7.1
5	6.5	10.2	7.6	7.2	8.0	4.9	6.2	4.8	6.2	7.1
6	6.7	10.4	7.7	6.4	7.8	4.7	6.45	4.9	6.1	6.6
7	6.5	11.6	7.7	6.0	7.2	5.3	6.25	4.85	6.0	6.5
8	6.5	13.0	7.85	7.4	6.75	4.9	6.1	4.4	5.55	6.5
9	6.5	13.0	7.5	8.45	6.4	5.05	5.9	4.85	5.4	6.5
10	6.5	12.9	7.35	8.75	6.35	4.8	5.3	4.9	5.1	6.1
11	6.4	13.0	7.1	8.6	6.3	4.95	5.8	4.75	5.75	6.6
12	6.4	13.2	7.0	8.4	6.0	5.0	5.2	4.8	5.9	6.7
13	6.4	13.0	6.9	7.8	6.0	5.0	4.9	4.6	5.9	6.2
14	6.4	12.85	6.75	7.4	5.8	5.3	4.9	5.1	5.3	5.9
15	6.4	13.0	7.5	6.9	5.6	5.0	4.95	4.75	5.3	5.85
16	6.4	13.3	8.1	6.8	5.5	4.95	4.9	5.15	5.3	6.0
17	6.4	13.3	7.85	6.7	5.1	5.0	5.15	5.0	5.2	6.4
18	6.4	12.9	7.8	6.3	5.3	5.05	5.7	4.8	5.2	7.6
19	6.3	12.1	7.25	6.4	5.3	4.8	5.2	4.65	5.7	7.6
20	6.3	11.3	7.2	5.9	5.3	4.7	4.9	4.8	6.4	.....
21	6.4	11.0	6.85	6.3	5.35	5.1	5.0	5.1	6.35	.....
22	6.4	10.8	6.7	6.8	5.35	4.8	5.25	5.55	6.35	.....
23	5.7	10.6	6.6	8.1	5.2	4.9	5.3	6.0	5.7	.....
24	5.7	10.1	6.2	8.3	5.05	5.95	5.2	5.75	5.4	.....
25	6.2	9.6	6.4	7.7	5.1	6.7	5.6	5.75	5.6	.....
26	6.5	9.15	6.4	7.3	5.05	6.9	5.45	6.0	5.6	.....
27	6.7	8.75	6.4	7.7	5.0	6.7	5.3	7.0	6.5	.....
28	7.1	8.4	7.2	8.3	5.2	7.3	5.15	7.1	7.1	.....
29	7.1	8.2	8.75	8.4	4.5	7.9	5.2	6.9	8.0	.....
30	7.9	7.9	8.7	8.6	5.1	7.5	5.15	7.0	8.9	.....
31	7.9	.....	8.5	.....	4.6	7.15	.....	6.6	.....	.....

NOTE.—Ice conditions January 1 to April 2, approximately. During March ice 1.6 feet thick. Ice conditions from about December 17 to 31.

Rating table for Wisconsin River near Necedah, Wis., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
4.50	2,810	5.60	5,380	6.60	8,200	8.20	13,000
4.60	3,020	5.70	5,640	6.70	8,500	8.40	13,600
4.70	3,240	5.80	5,900	6.80	8,800	8.60	14,200
4.80	3,460	5.90	6,170	6.90	9,100	8.80	14,800
4.90	3,690	6.00	6,440	7.00	9,400	9.00	15,400
5.00	3,920	6.10	6,720	7.20	10,000	9.20	16,000
5.10	4,150	6.20	7,010	7.40	10,600	9.40	16,600
5.20	4,390	6.30	7,300	7.60	11,200	9.60	17,200
5.30	4,630	6.40	7,600	7.80	11,800	9.80	17,800
5.40	4,880	6.50	7,900	8.00	12,400	10.00	18,400
5.50	5,130						

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904 and 1905. It is well defined between gage heights 4.5 feet and 10.5 feet. From gage height 6.3 feet to 11 feet the rating curve is a tangent, the difference being 300 per tenth. Above 11 feet the bank overflows, causing the discharge to increase at a greater rate per foot rise of gage.

Monthly discharge of Wisconsin River near Necedah, Wis., for 1906.

[Drainage area, 5,800 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
April	35,400	12,100	22,600	3.90	4.35
May	14,600	7,010	10,500	1.81	2.09
June	14,600	6,170	10,800	1.86	2.08
July	13,000	2,810	6,570	1.13	1.30
August	12,100	3,240	5,240	.903	1.04
September	8,800	3,690	5,140	.886	.99
October	9,700	2,600	4,840	.834	.96
November	15,100	4,150	6,760	1.17	1.30
December (1-19)[a]	13,900	6,040	8,160	1.41	1.00

[a] Discharge values December 17 to 19 corrected for ice conditions.

NOTE.—Values for 1906 good.

WAPSIPINICON RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Wapsipinicon River rises in Mower County, Minn., and flows southeastward, entering the Mississippi near Shafton, Scott County, Iowa. Its total drainage area is 2,300 square miles.

The river is generally fairly constant in flow, though its headwaters are sometimes low. As a rule, its banks are moderately high and the stream is well confined. There are numerous small power sites on this stream at Toronto, Oxford Mills, Newport, Anamosa, Central City, Troy Mills, Quasqueton, Independence, and Littleton. At several of these points, notably at Anamosa, there are good opportunities for building dams.

WAPSIPINICON RIVER AT STONE CITY, IOWA.

This station was established August 19, 1903. It is located in Stone City at the highway bridge, just above the Chicago, Milwaukee and St. Paul Railway bridge, and near the Dearborn stone quarry. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 73, where are given also references to publications that contain data for previous years.

Discharge measurements of Wapsipinicon River at Stone City, Iowa, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 12	M. S. Brennan	125	173	2.68	[a] 95
March 7	A. H. Horton	186	1,490	10.26	4,750
March 31	M. S. Brennan	189	2,200	13.64	9,340
April 2	do	181	1,430	9.88	4,580

[a] Stream frozen entirely across; thickness of ice, 0.9 foot. The discharge was about 60 per cent of the open-channel rating for gage height, 2.68 feet.

Daily gage height, in feet, of Wapsipinicon River at Stone City, Iowa, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	.....	9.42	12.45	3.62	3.95	2.95	2.90	2.72	3.08	2.68
2	.....	.....	10.02	10.00	3.60	4.32	2.92	2.90	2.68	3.02	2.80
3	2.76	.....	11.60	8.70	3.56	5.02	3.02	2.82	2.65	3.00	2.78
4	.....	.....	11.92	7.75	3.55	5.44	3.12	2.85	2.61	2.92	2.80
5	.....	.....	10.80	7.42	3.55	5.30	3.35	2.82	2.60	2.85	2.78
6	.....	.....	10.10	6.98	3.52	4.80	3.42	3.12	2.64	2.84	2.80
7	.....	3.04	9.30	6.85	3.50	4.35	3.40	3.04	2.62	2.80	2.76
8	.....	.....	8.80	6.70	3.48	3.92	3.30	3.00	2.62	2.78	2.74
9	2.68	.....	8.50	7.45	3.58	3.73	3.22	3.26	2.62	2.74	2.72
10	.....	.....	8.15	7.92	3.60	3.50	3.15	3.26	2.63	2.72	2.70
11	.....	.....	7.50	8.20	3.58	3.48	3.12	3.40	2.62	2.68	2.68
12	2.68	.....	7.10	8.20	3.52	3.34	3.10	3.68	2.72	2.66	2.66
13	.....	.....	6.35	7.88	3.48	3.25	3.35	3.68	2.82	2.68	2.65
14	.....	3.26	5.45	7.20	3.44	3.25	3.08	3.56	2.72	2.64	2.65
15	.....	.....	5.50	6.54	3.40	3.28	3.00	3.42	2.71	2.64	2.74
16	.....	.....	5.60	6.40	3.36	3.40	2.94	3.40	2.70	2.62	2.74
17	3.02	.....	5.45	6.23	3.38	3.35	2.90	3.35	2.75	2.62	2.75
18	.....	.....	4.95	5.90	3.52	3.24	2.85	3.22	2.76	2.62	2.72
19	.....	3.35	4.72	5.42	3.35	.....	2.82	3.12	2.85	2.62	2.70
20	.....	3.80	4.64	5.38	3.32	3.10	2.74	3.05	2.96	2.58	2.68
21	.....	5.05	4.30	5.05	3.25	3.10	2.80	3.00	2.95	2.56	2.70
22	.....	6.12	4.16	4.78	3.30	3.10	2.90	2.94	3.15	2.61	2.62
23	3.75	7.44	3.92	4.55	3.60	3.06	2.88	2.91	3.32	2.60	2.54
24	.....	7.95	3.80	4.38	4.02	3.02	2.81	2.85	3.52	2.64	2.52
25	.....	8.40	3.84	4.12	4.30	3.04	2.80	2.90	3.55	2.62	2.68
26	.....	8.55	4.45	3.96	4.30	2.92	2.72	2.96	3.54	2.60	2.96
27	.....	8.95	6.09	3.85	4.02	2.98	2.76	2.92	3.42	2.62	2.92
28	.....	9.55	7.42	3.72	3.95	2.96	2.78	2.88	3.30	2.64	3.12
29	.....	.....	8.90	3.65	4.02	2.94	2.88	2.84	3.22	2.64	3.08
30	.....	.....	10.82	3.60	3.84	2.98	2.96	2.80	3.15	2.65	3.08
31	3.16	.....	13.66	.....	3.75	.....	2.92	2.79	.....	2.66	.....

NOTE.—River frozen January 1 to March 2; thickness of ice increasd from 0.5 foot January 3 to 1.3 feet February 14. River also frozen November 23 to 27 and December 7 to 31. During December the thickness of the ice was about 0.3 foot.

Rating table for Wapsipinicon River at Stone City, Iowa, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.50	115	3.70	570	4.90	1,185	7.20	2,580
2.60	137	3.80	620	5.00	1,240	7.40	2,710
2.70	162	3.90	670	5.20	1,350	7.60	2,840
2.80	189	4.00	720	5.40	1,460	7.80	2,980
2.90	218	4.10	770	5.60	1,580	8.00	3,120
3.00	250	4.20	820	5.80	1,700	9.00	3,850
3.10	286	4.30	870	6.00	1,820	10.00	4,640
3.20	326	4.40	920	6.20	1,940	11.00	5,520
3.30	370	4.50	970	6.40	2,060	12.00	6,560
3.40	420	4.60	1,020	6.60	2,190	13.00	7,770
3.50	470	4.70	1,075	6.80	2,320	14.00	9,160
3.60	520	4.80	1,130	7.00	2,450		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904–1906. It is well defined above gage height 2.7 feet.

nthly discharge of Wapsipinicon River at Stone City, Iowa, for 1906.

[Drainage area, 1,310 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	8,690	620	2,890	2.21	2.55
.....	7,100	520	2,170	1.66	1.85
.....	870	348	531	.405	.47
.....	1,480	224	523	.399	.45
.....	430	167	258	.197	.23
.....	560	186	293	.224	.26
.....	495	137	236	.180	.20
.....	279	128	166	.127	.15
.....	294	119	180	.137	.15

Values for 1906 are excellent. During the winter period the minimum flow was probably at w as 40 second-feet.

ROCK RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

: River rises in the southeastern part of Wisconsin, flows and southwest, and enters the Mississippi just below Rock Ill. Its length is 286 miles. Of the total drainage area) square miles), 5,650 square miles are in Wisconsin and 5,350 ois. The length of the basin is 175 miles; its greatest width the Wisconsin-Illinois State line, where for 20 miles or more ages about 80 miles; above the boundary it averages 40 or 50 n width, while below, in Illinois, it narrows rapidly.

ne upper part of its course the river flows rather toward the side of the basin, but near the State line it approaches the and finally flows decidedly near the western boundary of its ge area. The total fall of the stream, distributed with com- e uniformity throughout its length, is 340 feet, an average of t per mile.

country drained is undulating and comprises large expanses roken prairie, groves, and extensive bodies of timber, swamp, ce.

data collected in this basin are valuable for water-power es.

ROCK RIVER AT ROCKTON, ILL.

station was established May 13, 1903. It is located at the on highway bridge, one-half mile from the Chicago, Milwaukee Paul Railway station, 1 mile below the dam, and three-fourths elow the junction of Pecatonica River with Rock River. The ons at this station and the bench marks are described in Water- Paper No. 171, page 76, where are given also references to ations that contain data for previous years.

Discharge measurements of Rock River at Rockton, Ill., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 31	M. S. Brennan	503	2,390	5.79	8,240
February 24	do	510	4,300	9.85	16,000
February 25	do	510	4,740	10.55	18,600
February 27	do	510	4,130	9.36	15,400
February 27	do	510	4,180	9.45	16,500
February 28	do	510	4,000	9.13	14,900
May 3	do	494	1,420	4.10	4,570

NOTE.—Measurements January 31 to February 28, inclusive, were slightly affected by ice conditions below the gaging section.

Daily gage height, in feet, of Rock River at Rockton, Ill., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Oct.	Nov.	Dec.
1	3.3	5.45	8.8	8.7	4.15	3.15	3.3	1.1	1.5	3.25
2	2.95	5.0	8.8	8.45	4.15	3.0	3.2	1.4	1.6	3.0
3	2.85	5.72	11.15	7.95	4.1	2.8	3.15	1.3	1.4	2.85
4	3.9	5.45	10.8	7.0	4.1	2.45	3.05	1.2	1.5	2.7
5	4.57	6.75	10.0	6.25	4.0	2.8	3.0	1.1	1.45	2.6
6	4.9	6.9	10.25	6.15	3.9	2.8	2.9	1.05	1.55	2.9
7	4.9	5.75	9.85	6.1	3.95	2.8	2.85	1.4	1.55	2.65
8	5.6	7.15	9.45	6.15	3.85	2.8	2.7	1.15	1.5	2.25
9	6.25	6.5	9.25	6.65	3.8	2.6	2.7	1.1	1.4	2.4
10	6.0	5.45	8.75	7.0	3.7	2.6	2.6	1.0	1.4	2.4
11	4.85	5.75	8.4	7.0	3.6	2.55	2.6	1.1	1.4	2.35
12	4.0	5.7	6.8	6.45	3.6	2.7	2.5	1.1	1.35	2.35
13	3.5	4.7	6.05	6.8	3.4	2.6	2.4	1.1	1.45	2.3
14	3.1	4.7	6.2	6.4	3.5	2.5	2.45	1.1	1.4	2.3
15	3.4	5.88	6.2	6.15	3.5	2.5	2.5	1.0	1.4	2.3
16	8.4	5.7	6.0	6.25	3.45	2.5	2.45	.95	1.3	2.0
17	7.25	5.45	6.25	6.05	3.2	2.3	2.5	1.0	1.15	2.0
18	7.1	5.1	5.61	5.9	3.15	2.3	2.4	1.0	1.3	2.0
19	7.3	4.3	5.31	5.75	3.0	2.45	2.3	.95	1.1	2.15
20	7.3	5.0	5.0	5.6	2.95	2.35	2.4	1.0	1.3	2.2
21	9.62	9.4	4.75	5.4	3.05	2.7	.....	1.25	1.3	2.0
22	9.5	9.1	4.3	5.35	2.9	2.6	.....	1.25	1.75	2.0
23	7.85	8.83	4.5	5.25	2.9	2.7	.....	1.3	1.95	2.0
24	8.7	9.25	4.4	5.0	2.9	2.65	.....	1.25	1.75	2.0
25	9.3	10.7	4.4	4.8	2.85	2.6	.....	1.3	1.8	1.5
26	9.5	9.85	4.65	4.7	2.9	2.75	.....	1.35	2.4	2.5
27	9.15	9.4	8.21	4.55	3.1	2.6	.....	1.4	3.4	1.5
28	8.3	9.25	8.3	4.53	3.4	2.5	.....	1.5	3.9	1.5
29	7.8	.....	8.7	4.5	3.2	3.1	.....	1.6	3.85	1.65
30	7.1	.....	8.8	4.21	3.6	3.3	.....	1.6	3.65	1.45
31	6.05	.....	8.75	.....	3.5	.....	.....	1.7	.....	2.01

NOTE.—Ice conditions January 5 to 10 and February 8 to 20; slight ice conditions during December. Gage heights are to water surface. This station was temporarily discontinued from July 21 to September 30.

Rating table for Rock River at Rockton, Ill., for 1904–1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	500	2.10	1,470	3.20	3,105	4.60	5,760
1.10	560	2.20	1,600	3.30	3,280	4.80	6,180
1.20	624	2.30	1,740	3.40	3,455	5.00	6,620
1.30	692	2.40	1,880	3.50	3,635	5.20	7,070
1.40	764	2.50	2,025	3.60	3,815	5.40	7,540
1.50	840	2.60	2,170	3.70	3,995	5.60	8,020
1.60	925	2.70	2,320	3.80	4,180	5.80	8,520
1.70	1,020	2.80	2,470	3.90	4,365	6.00	9,020
1.80	1,122	2.90	2,620	4.00	4,555	7.00	11,520
1.90	1,234	3.00	2,775	4.20	4,940	9.00	16,520
2.00	1,350	3.10	2,935	4.40	5,345	11.00	21,520

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1904–1906. It is well defined between gage heights 2.4 feet and 6 feet. The table has been extended beyond these limits, being based on one measurement at 13.32 feet. Above gage height 5.6 feet the rating curve is a tangent, the difference being 250 per tenth. Below gage height 2 feet [illegible]ng is approximate.

Monthly discharge of Rock River at Rockton, Ill., for 1906.

[Drainage area, 6,150 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
.....	18,100	2,540	9,620	1.56	1.80
ry.....	19,000	4,000	9,760	1.59	1.66
.....	20,300	5,140	11,800	1.92	2.21
.....	15,800	4,960	9,160	1.49	1.66
.....	4,840	2,540	3,590	.584	.67
.....	3,280	1,740	2,280	.371	.41
0.....	3,280	1,740	2,330	.379	.28
.....	1,020	472	641	.104	.12
ber.....	4,360	560	280	.208	.23
ber.....	3,190	802	740	.283	.33

.—Values are rated as follows: January and March, good; February and October, approxi- April to July, excellent; November and December, fair. Discharge for ice periods corrected.

ROCK RIVER NEAR NELSON, ILL.

is station was established June 8 and was discontinued July 21, . It is located about 1¼ miles west of Nelson, Ill., at the Chi- and Northwestern Railway bridge.

e channel is straight for 1,000 feet above and below the station. right bank is high and does not overflow; the left bank is low overflows. All of the discharge passes the section. The bed of river is rocky and permanent, and the current is of moderate ness. The remains of old piers and an island above the station affect the flow.

scharge measurements were made from the downstream side of five-span railway bridge to which the gage is attached. The l point for soundings is the center of the right floor beam, h rests upon the right abutment.

e standard chain gage, which was read once each day by John laughlin, is located on the lower side of the bridge about the er of the second span from the left side. Length of chain, 31.28

e bench mark is the top of the downstream end of the floor 363 feet from the right end of bridge; elevation, 30 feet above gage datum.

Discharge measurements of Rock River near Nelson, Ill., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
.....	M. S. Brennan.....	621	3,020	6.19	5,380
.....	A. H. Horton.....	602	2,260	5.02	2,720
0.....	.....do.....	615	2,920	6.12	5,190

Daily gage height, in feet, of Rock River near Nelson, Ill., for 1906.

Day.	June.	July.	Day.	June.	July.
1	.....	6.2	16	4.7	4.7
2	.....	5.6	17	4.65	4.6
3	.....	5.6	18	4.55	4.7
4	.....	5.5	19	4.35	4.5
5	.....	5.6	20	4.85	4.5
6	.....	5.3	21	5.0	4.6
7	.....	5.2	22	5.0	.....
8	5.2	5.1	23	4.8	.....
9	5.05	5.0	24	4.85	.....
10	5.0	4.8	25	4.7	.....
11	4.75	4.9	26	4.8	.....
12	4.65	4.9	27	4.85	.....
13	4.85	4.7	28	8.0	.....
14	4.9	4.7	29	6.4	.....
15	4.8	4.7	30	6.15	.....

ROCK RIVER AT STERLING, ILL.

This station was established January 5, 1905, and was discontinued March 3, 1906, on account of an ice gorge destroying the bridge. It was located on the new highway bridge in Sterling, Ill., about one-half mile below the dam of the Sterling Manufacturing Company. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 78, where are given also references to publications that contain data for previous years.

Discharge measurements of Rock River at Sterling, Ill., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 16 *a*	M. S. Brennan	553	1,780	7.40	*c* 3,370
January 16 *b*	do	282	1,220	8.20	*c* 2,300

a North channel. *b* South channel. *c* Ice conditions.

Daily gage height, in feet, of Rock River, at Sterling, Ill., for 1906.

Day.	North channel.		South channel.		Day.	North channel.		South channel.	
	Jan.	Feb.	Jan.	Feb.		Jan.	Feb.	Jan.	Feb.
1	6.04	14.71	5.88	15.72	17	7.00	13.10	7.04	14.90
2	6.06	14.64	5.90	15.64	18	6.98	.....	7.02	.....
3	6.12	14.65	5.95	15.64	19	6.98	.....	7.06	.....
4	6.12	.....	5.98	.....	20	7.00	.....	7.10	.....
5	6.12	.....	6.00	.....	21	9.20	.....	9.32	.....
6	6.16	.....	6.06	.....	22	*a* 11.84	.....	*a* 11.94	.....
7	6.38	.....	6.22	.....	23	13.26	.....	13.52	.....
8	6.46	.....	6.29	.....	24	14.38	.....	14.78	.....
9	6.52	.....	6.36	.....	25	15.2	.....	16.30	.....
10	6.58	13.00	6.40	14.10	26	15.45	.....	16.50	.....
11	6.63		6.46	.....	27	15.52	.....	16.50	.....
12	6.77		6.66	.....	28	15.3	.....	16.52	.....
13	6.82		6.70	.....	29	15.19	.....	16.26	.....
14	6.88		6.77	.....	30	14.78	.....	15.66	.....
15	6.98		7.04	.....	31	14.98	.....	15.69	.....
16	6.98		7.04	.....					

a Ice conditions January and February; both channels gorged with ice January 22 to February 26. South Channel bridge carried away February 22; North Channel bridge carried away February 25.

IOWA RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Iowa River rises in north-central Iowa, flows in a southeasterly direction, and joins the Mississippi about 30 miles above Burlington. Its chief tributary is Cedar River, which rises in Minnesota and flows into the Iowa about 50 miles above the mouth of the latter. The total drainage area of the Iowa is 12,400 square miles, 4,470 square miles of this being tributary to it above its junction with Cedar River at Columbus Junction. Cedar River drains 7,600 square miles above its union with Iowa River.

The chief power plants in the Iowa basin are at Iowa City, Marshalltown, Cedar Rapids, Waterloo, and Cedar Falls. The data collected in this basin are valuable for water-power purposes.

IOWA RIVER AT IOWA CITY, IOWA.

This station was established June 1, 1903, and was discontinued July 21, 1906. It is located on the county bridge directly west of the university grounds. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 83, where are given also references to publications that contain data for previous years.

A measurement was made at this station on June 1, 1906, by M. S. Brennan, giving the following results:

Width, 171 feet; area, 735 square feet; gage height, —0.35 foot; discharge, 470 feet.

At the time of this measurement there was ice along the shore. Therefore the discharge was about 70 per cent of the open-channel rating.

Daily gage height, in feet, of Iowa River at Iowa City, Iowa, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1			9.3	6.8	1.9		
2			9.9	7.2	1.9		1.1
3		2.2	8.3	7.6	2.0		.9
4			7.7	7.6	1.9	1.3	2.3
5			6.8	7.6	1.8	1.2	1.8
6			6.6	7.6	1.7	1.5	1.5
7			5.8	7.0	1.7	1.5	1.2
8			4.7	6.1	1.9	1.3	.8
9		1.2	4.4	6.2	1.9	1.2	.4
10			4.0	5.8	1.8	.9	.4
11			3.4	5.5	1.6	.8	— .2
12			2.8	5.4		.6	— .3
13	0.1		2.4	5.0	1.3	.6	— .5
14			2.0	4.7	1.1	.6	— .5
15			1.8	4.6	1.1	.5	— .7
16			1.8	4.2	1.0	.5	— .7
17		1.2	2.5	4.1	.9	.5	— .7
18			2.4	4.2	.9	.3	—1.0
19			1.8	4.3	.8	.5	— .8
20			2.7	4.2	.8	.8	— .8

Daily gage height, in feet, of Iowa River at Iowa City, Iowa, for 1906—Continued.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
21	6.0	.....	2.3	4.0	0.6	.....	-0.8
22	.....	.....	2.1	3.7	1.3	1.1	.....
23	.....	.....	1.9	3.4	1.8	1.0	.....
24	.....	7.6	1.4	3.1	2.1	1.1	.....
25	.....	8.0	1.4	2.8	2.3	1.1	.....
26	.....	8.0	5.95	2.5	.....	1.0	.....
27	2.7	9.4	5.4	2.2	2.5	.9	.....
28	.....	9.6	4.5	2.1	1.7	.7	.....
29	.....	.....	5.3	1.9	1.8	.6	.....
30	.....	.....	6.2	1.8	1.7	1.0	.....
31	.....	.....	6.6	.....	1.7	.....	.....

NOTE.—River frozen, January 1 to February 23; January 13, ice 0.8 foot thick; January 21, rise caused by ice jam; January 27, open water within 2 feet of gage; February 3, open water within 4 feet of gage; February 9, small opening below gage; February 17, gage reading to top of ice; February 24 and 25, ice jam. After June 3 gage heights were affected slightly by the construction of a dam below the station.

Rating table for Iowa River at Iowa City, Iowa, for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
-1.00	360	0.30	916	1.60	1,760	3.80	3,650
-0.90	392	0.40	971	1.70	1,830	4.00	3,840
-0.80	426	0.50	1,028	1.80	1,900	4.20	4,030
-0.70	462	0.60	1,087	1.90	1,970	4.40	4,220
-0.60	499	0.70	1,148	2.00	2,040	4.60	4,410
-0.50	538	0.80	1,210	2.20	2,190	4.80	4,600
-0.40	579	0.90	1,274	2.40	2,350	5.00	4,800
-0.30	622	1.00	1,340	2.60	2,520	6.00	5,900
-0.20	666	1.10	1,410	2.80	2,700	7.00	7,150
-0.10	712	1.20	1,480	3.00	2,890	8.00	8,540
0.00	760	1.30	1,550	3.20	3,080	9.00	10,040
0.10	810	1.40	1,620	3.40	3,270	10.00	11,600
0.20	862	1.50	1,690	3.60	3,460		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1905. It is well defined above gage height -1 foot.

Monthly discharge of Iowa River at Iowa City, Iowa, for 1906.

[Drainage area, 3,320 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft per sq. mile.	Depth in inches.
March	11,400	1,620	4,420	1.33	1.53
April	7,960	1,900	4,750	1.43	1.60
May	2,440	1,090	1,760	.530	.61
June	1,760	916	1,310	.395	.44
July (1-21)	2,270	360	948	.286	.22

NOTE.—Values are rated as follows: March, June, and July, good; April and May, excellent. The minimum flow during ice period was at least as low as 470 second-feet.

CEDAR RIVER AT CEDAR RAPIDS, IOWA.

This station was established October 26, 1902. It is located at Cedar Rapids, Iowa, about 50 miles above the mouth of the river, and is near the city gas works and the plant of the Iowa Windmill and Pump Company. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 86, where are given also references to publications that contain data for previous years.

Discharge measurements of Cedar River at Cedar Rapids, Iowa, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
h 31	M. S. Brennan	658	6,550	11.82	32,900
h 31	do	658	6,060	11.05	29,900
1	do	653	4,390	8.60	20,200
1	do	658	4,740	9.15	22,200
2	do	651	3,740	7.60	15,700

Daily gage height, in feet, of Cedar River at Cedar Rapids, Iowa, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	3.0	3.35	8.25	8.2	4.15	5.55	3.75	3.5	3.35	4.05	3.75	4.15
	2.9	3.55	7.4	7.1	4.15	5.3	3.7	3.45	3.3	4.0	3.65	4.15
	2.85	3.6	7.55	6.3	4.15	4.95	3.8	3.4	3.3	3.9	3.65	4.05
	2.85	3.55	7.5	6.05	4.3	4.7	3.7	3.35	3.25	3.85	3.6	4.1
	2.9	3.5	7.4	5.8	4.5	4.5	3.8	3.3	3.55	3.75	3.6	4.05
	2.9	3.45	7.2	5.6	4.45	4.35	4.05	3.3	3.65	3.75	3.6	4.0
	3.0	3.55	6.65	5.55	4.4	4.25	3.85	3.7	3.7	3.6	3.55	3.95
	3.2	3.65	6.3	5.55	4.35	4.2	3.75	3.85	3.65	3.55	3.55	3.15
	3.15	3.5	5.8	5.75	4.2	4.2	3.6	4.4	3.6	3.45	3.5	3.45
	2.8	3.45	5.6	5.8	4.1	4.2	3.55	4.3	3.55	3.45	3.45	3.35
	2.8	3.45	5.4	5.7	4.05	4.15	3.45	4.6	3.45	3.45	3.5	3.4
	2.75	3.4	5.2	5.65	4.0	4.05	3.45	4.95	3.4	3.4	3.6	3.45
	2.85	3.35	4.3	5.8	3.95	3.95	3.45	4.9	3.35	3.4	3.55	3.6
	3.0	3.35	4.15	5.65	3.95	3.9	3.45	4.65	3.3	3.3	3.55	3.85
	3.15	3.3	4.25	5.45	3.9	3.85	3.4	4.4	3.3	3.25	3.55	4.45
	3.15	3.3	4.4	5.55	3.85	3.75	3.35	4.25	3.2	3.3	3.55	4.7
	3.25	3.3	4.35	5.75	4.0	3.7	3.4	4.05	3.3	3.3	3.55	4.2
	3.2	3.45	4.3	5.9	5.05	3.65	3.4	4.0	3.35	3.3	3.55	4.35
	3.15	3.5	4.25	5.85	5.85	3.75	3.35	3.85	3.5	3.25	3.55	4.05
	3.0	4.3	4.25	5.55	6.35	3.65	3.35	3.85	4.4	3.3	3.55	3.9
	3.9	4.5	4.2	5.3	5.9	3.55	3.4	3.8	4.6	3.25	3.6	3.95
	4.5	4.6	4.2	5.2	5.45	3.6	3.45	3.65	4.55	3.25	3.65	4.65
	3.8	5.55	4.15	4.8	5.1	3.65	3.55	3.65	4.5	3.2	3.5	4.5
	3.5	5.45	4.2	4.65	4.75	3.8	.....	3.7	4.6	3.35	3.45	4.45
	3.4	5.55	4.15	4.5	4.7	3.85	.....	3.65	4.75	3.35	3.5	4.45
	3.4	5.85	5.1	4.4	4.5	3.75	.....	3.7	4.8	3.3	3.65	4.2
	3.3	7.8	5.5	4.25	4.5	3.7	3.3	3.65	4.65	3.45	3.85	4.05
	3.3	8.37	6.45	4.2	4.85	3.65	3.3	3.45	4.45	3.6	3.9	3.95
	3.3	.....	10.29	4.15	4.95	3.6	3.25	3.4	4.25	3.8	3.9	3.8
	3.25	.....	16.27	4.1	5.2	3.65	3.25	3.4	4.15	3.8	4.1	3.95
	3.3	.....	12.1	.....	5.55	.....	3.3	3.35	.....	3.75	.....	4.25

RE.—River generally frozen over January 1 to March 15; open channel at gage during ice period; frozen along shore December 17 to 31.

Rating table for Cedar River at Cedar Rapids, Iowa, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.70	600	3.80	2,575	4.90	6,150	6.00	10,000
2.80	720	3.90	2,875	5.00	6,500	6.20	10,750
2.90	840	4.00	3,175	5.10	6,850	6.40	11,510
3.00	970	4.10	3,475	5.20	7,200	6.60	12,280
3.10	1,110	4.20	3,800	5.30	7,550	6.80	13,060
3.20	1,270	4.30	4,125	5.40	7,900	7.00	13,850
3.30	1,440	4.40	4,450	5.50	8,250	8.00	17,800
3.40	1,625	4.50	4,775	5.60	8,600	10.00	25,700
3.50	1,825	4.60	5,100	5.70	8,950	12.00	33,600
3.60	2,050	4.70	5,450	5.80	9,300	14.00	41,500
3.70	2,300	4.80	5,800	5.90	9,650	16.00	49,400

RE.—The above table is applicable only for open-channel conditions. It is based on discharge irements made during 1903–1906. It is well defined between gage heights 2.9 feet and 12 feet. e gage height 7 feet the rating curve is a tangent, the difference being 395 per tenth.

Monthly discharge of Cedar River at Cedar Rapids, Iowa, for 1906.

[Drainage area, 6,320 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	4,780	600	1,350	0.214	0.25
February	19,300	1,440	4,200	.665	.69
March	50,500	3,640	11,000	1.74	2.01
April	18,600	3,480	8,210	1.30	1.45
May	11,300	2,720	5,240	.829	.96
June	8,420	1,940	3,400	.538	.60
July	3,320	1,360	1,880	.297	.34
August	6,320	1,440	2,860	.453	.52
September	5,800	1,270	5,810	.919	1.03
October	3,320	1,270	1,910	.302	.35
November	3,480	1,720	2,120	.335	.37
December	5,450	1,190	3,310	.524	.60
The year	50,500	660	4,270	.676	9.17

NOTE.—Discharge applied as for open channel during winter period, which may give somewhat excessive results. Values are rated as follows: January, February, and December, good; March to November, excellent.

RED CEDAR RIVER AT JANESVILLE, IOWA.

This station was established April 26, 1905, and was discontinued September 30, 1906. It is located on the Illinois Central Railroad bridge at Janesville, Iowa, about one-fourth mile below the highway bridge. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 86, where are given also references to publications that contain data for previous years.

Discharge measurements of Red Cedar River at Janesville, Iowa, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 11	M. S. Brennan	136	178	1.70	[a]228
March 18	A. H. Horton	236	1,118	5.72	[b]1,930
March 28	M. S. Brennan	229	2,570	12.12	17,500
March 29	do	229	2,150	10.26	11,200
March 29	do	229	1,980	9.51	9,370
March 29	do	229	1,860	9.01	8,310
March 30	do	229	1,430	7.14	5,350
March 30	do	229	1,510	7.46	5,730

[a] River frozen entirely across. Gage height to bottom of ice, 0.70 foot; ice, 1.2 feet thick. Discharge about 70 per cent less than the open-channel rating at gage height 1.70 feet.
[b] Ice gorge one-fourth mile below station reduced the discharge about 50 per cent.

Daily gage height, in feet, of Red Cedar River at Janesville, Iowa, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1			6.7	4.9	1.8	3.8	1.7	1.3	1.0
2				4.1	2.0	3.2	1.6	1.2	1.0
3		1.9	10.0	3.8	2.2	2.8	1.5	1.1	1.3
4			9.4	3.6	2.5	2.6	1.8	1.1	1.7
5	1.7		8.8	3.5	2.4	2.4	1.5	1.1	1.7
6			7.6	3.5	2.2	2.3	1.4	1.4	1.8
7			6.2	3.6	2.0	2.3	1.4	1.3	1.7
8			5.7	3.5	1.9	2.7	1.3	1.9	1.5
9			6.0	3.8	1.8	2.6	1.2	2.3	1.4
10		1.7	4.0	4.1	1.7	2.6	1.2	3.6	1.3

)aily gage height, in feet, of Red Cedar River at Janesville, Iowa, for 1906—(Cont'd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
	1.7			4.1	1.7	2.2	1.2	3.4	1.1
	1.7		6.1	4.0	1.7	2.0	1.1	2.7	1.2
			6.1	3.7	1.6	1.9	1.2	2.2	1.1
			6.2	3.8	1.6	1.8	1.2	2.0	1.0
			5.7	5.1	1.6	1.7	1.2	1.7	1.0
			5.5	5.6	4.5	1.6	1.2	1.6	1.0
		2.0	5.0	4.9	8.3	1.6	1.2	1.5	1.8
			4.9	4.0	7.2	1.5	1.1	1.4	3.8
	1.9		4.6	3.4	5.6	1.5	1.1	1.4	4.3
			4.0	3.0	4.0	1.5	1.1	1.3	3.5
			4.1	2.8	3.3	1.5	[a] 1.1	1.2	3.1
			3.6	2.6	2.7	1.4	1.1	1.2	2.9
			3.6	2.5	2.4	1.4	1.1	1.2	4.5
		6.6	3.6	2.3	2.2	1.4	1.1	1.2	5.0
		8.3	2.4	2.2	2.3	1.3	1.1	1.2	4.5
		10.0	6.9	2.1	3.2	1.3	1.1	1.1	3.3
	1.9	8.4	12.5	1.9	4.7	1.3	1.1	1.1	2.6
		8.1	13.3	2.0	6.1	1.3	1.1	1.1	2.2
			10.1	1.9	6.3	2.0	1.5	1.1	2.0
			7.2	1.8	6.0	1.5	1.7	1.0	1.8
			6.0		4.7		1.4	1.0	

[a] Interpolated July 21 to 27.

TE.—Ice conditions January 1 to March 25: Thickness of ice January 12 to February 17, 1.3 feet. uary 24 to March 1, ice broken up. March 3 to 9, river clear of floating ice but gorged below gage. h 12 to 21, river blocked with ice.

Rating table for Red Cedar River at Janesville, Iowa, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	380	2.40	1,300	3.80	2,340	6.40	4,560
1.10	440	2.50	1,370	3.90	2,420	6.60	4,760
1.20	500	2.60	1,440	4.00	2,500	6.80	4,970
1.30	560	2.70	1,510	4.20	2,660	7.00	5,190
1.40	620	2.80	1,580	4.40	2,820	7.20	5,420
1.50	680	2.90	1,650	4.60	2,980	7.40	5,660
1.60	740	3.00	1,720	4.80	3,140	7.60	5,910
1.70	810	3.10	1,790	5.00	3,300	7.80	6,180
1.80	880	3.20	1,860	5.20	3,470	8.00	6,500
1.90	950	3.30	1,940	5.40	3,640	9.00	8,270
2.00	1,020	3.40	2,020	5.60	3,820	10.00	10,500
2.10	1,090	3.50	2,100	5.80	4,000	11.00	13,500
2.20	1,160	3.60	2,180	6.00	4,180	12.00	17,000
2.30	1,230	3.70	2,260	6.20	4,370	13.00	21,100

TE.—The above table is applicable only for open-channel conditions. It is based on discharge urements made during 1905–6. It is well defined between gage heights 1 foot and 12 feet.

Monthly discharge of Red Cedar River at Janesville, Iowa, for 1906.

[Drainage area, 1,840 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
h (26–31)	22,600	4,180	11,200	6.09	1.36
	3,820	880	2,060	1.12	1.25
	7,030	740	2,070	1.12	1.29
	2,340	560	1,010	.549	.61
	880	440	548	.298	.34
ıst	2,180	380	732	.398	.46
ımber	3,300	380	1,200	.652	.73

TE.—Values for 1906 are excellent. The flow during the winter period probably did not fall much r 240 second-feet.

DES MOINES RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Des Moines River rises in the southern part of Minnesota, flows to the south and southeast, and enters the Mississippi near Keokuk, Iowa. Its principal tributary is Raccoon River, which joins it at the city of Des Moines. The total drainage area of the Des Moines is 14,7[illegible] square miles. Above the mouth of the Raccoon its drainage area is 6,460 miles, while that of the Raccoon at its confluence with the Des Moines is 3,680 square miles.

The Des Moines is the largest stream in the State of Iowa and affords numerous opportunities for the development of water power. It is the natural recipient of the sewage of many towns.

DES MOINES RIVER AT FORT DODGE, IOWA.

This station was established April 21, 1905, and was discontinued July 1[illegible], 1906. It is located at the "Swede Town" bridge, the only highway bridge in Fort Dodge. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 9[illegible].

[illegible] Des Moines River at Fort Dodge, June, 1906.

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] Des Moines River at Fort Dodge, June, 1906.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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Rating table for Des Moines River at Fort Dodge, Iowa, for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.60	550	3.70	1,450	4.80	2,835	5.90	4,535
2.70	615	3.80	1,555	4.90	2,985	6.00	4,690
2.80	685	3.90	1,665	5.00	3,140	6.20	5,010
2.90	755	4.00	1,780	5.10	3,295	6.40	5,350
3.00	830	4.10	1,895	5.20	3,450	6.60	5,710
3.10	905	4.20	2,015	5.30	3,605	6.80	6,080
3.20	985	4.30	2,140	5.40	3,760	7.00	6,460
3.30	1,070	4.40	2,270	5.50	3,915	7.20	6,840
3.40	1,160	4.50	2,405	5.60	4,070	7.40	7,220
3.50	1,255	4.60	2,545	5.70	4,225	7.60	7,600
3.60	1,350	4.70	2,690	5.80	4,380	7.80	7,980

TE.—The above table is applicable only for open-channel conditions. It is based on 8 discharge urements made during 1905 and 1906. It is well defined between gage heights 3.3 feet and 6 feet.

Monthly discharge of Des Moines River at Fort Dodge, Iowa, for 1906.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
h (26–31)	[a] 12,000	4,380	7,220
l	5,350	2,080	3,880
	4,850	1,120	2,220
	1,780	905	1,390
(1–19)	1,260	550	828

[a] Discharge estimated.

TE.—Values are rated as follows: March to June, excellent; July, good.

DES MOINES RIVER AT DES MOINES, IOWA.

This station was established May 24, 1905, and was discontinued y 20, 1906. It was located at the Interurban Bridge at Des ines, Iowa, near the suburb of Highland Park. The conditions this station and the bench marks are described in Water-Supply per No. 171, page 92, where are given also references to publica- ns that contain data for previous years.

Discharge measurements of Des Moines River at Des Moines, Iowa, in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
h 10	A. H. Horton	284	1,910	7.50	3,420
l 4	M. S. Brennan	289	2,440	8.90	5,650
22	do	278	1,680	6.96	2,500

Daily gage height, in feet, of Des Moines River at Des Moines, Iowa, for 1906.

Day.	Mar.	Apr.	May.	June.	July.	Day.	Mar.	Apr.	May.	June.	July.
1	8.6	10.2	7.8	6.6	6.2	17	8.0	11.7	8.2	6.1	5.7
2	8.4	9.1	8.5	6.6	6.1	18	7.9	11.5	8.0	6.1	5.8
3	8.3	8.8	9.3	6.6	6.1	19	8.0	10.4	7.8	6.9	5.8
4	8.3	8.75	9.6	6.5	6.1	20	8.0	9.3	7.7	6.6	5.8
5	7.9	9.0	9.4	6.5	6.05	21	7.6	9.35	7.5	6.4	.....
6	7.6	8.8	9.0	6.4	6.0	22	7.4	9.0	7.4	6.3	.....
7	7.6	8.75	8.4	6.4	6.0	23	7.4	8.6	7.3	6.3	.....
8	7.4	8.8	8.1	6.3	5.9	24	7.6	8.3	7.1	6.4	.....
9	7.3	8.9	7.7	6.3	5.9	25	7.7	7.6	7.1	6.3	.....
10	6.7	9.5	7.4	6.4	5.9	26	8.8	7.3	7.0	6.3	.....
11	6.9	9.7	7.2	6.4	5.7	27	9.6	7.5	6.9	6.2	.....
12	7.3	9.7	7.1	6.3	5.75	28	11.5	7.3	6.8	6.2	.....
13	8.0	10.3	7.0	6.2	5.8	29	12.5	7.3	6.7	6.1	.....
14	8.2	10.6	6.8	6.2	5.7	30	12.9	7.4	6.7	6.1	.....
15	8.1	11.1	6.8	6.2	5.8	31	11.8	.....	6.6	.....	.....
16	8.0	11.4	6.9	6.1	5.7						

NOTE.—River open March 1 to 12, but frozen March 13 to 25.

Rating table for Des Moines River at Des Moines, Iowa, for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
5.20	790	6.60	2,130	8.00	4,100	9.80	7,320
5.30	860	6.70	2,250	8.10	4,260	10.00	7,700
5.40	940	6.80	2,370	8.20	4,430	10.20	8,100
5.50	1,020	6.90	2,490	8.30	4,600	10.40	8,500
5.60	1,100	7.00	2,620	8.40	4,770	10.60	8,900
5.70	1,190	7.10	2,760	8.50	4,940	10.80	9,300
5.80	1,280	7.20	2,900	8.60	5,110	11.00	9,700
5.90	1,370	7.30	3,040	8.70	5,290	11.20	10,100
6.00	1,470	7.40	3,190	8.80	5,470	11.40	10,520
6.10	1,570	7.50	3,340	8.90	5,650	11.60	10,940
6.20	1,680	7.60	3,490	9.00	5,830	11.80	11,360
6.30	1,790	7.70	3,640	9.20	6,200	12.00	11,780
6.40	1,900	7.80	3,790	9.40	6,570	13.00	13,940
6.50	2,010	7.90	3,940	9.60	6,940		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 5 discharge measurements made during 1905–6. It is well defined between gage heights 5.5 feet and 9 feet.

Monthly discharge of Des Moines River at Des Moines, Iowa, for 1906.

[Drainage area, 6,460 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
March	13,700	2,250	5,000	0.774	0.89
April	11,200	3,040	6,310	.977	1.09
May	6,940	2,130	3,580	.554	.64
June	2,490	1,570	1,840	.285	.32
July (1-20)	6,800	1,190	1,620	.251	.19

NOTE. Values are rated as follows: March, good; April to July, excellent. Flow during March was probably not greatly affected by ice conditions.

DES MOINES RIVER AT KEOSAUQUA, IOWA.

ıis station was established May 30, 1903, and discontinued July .906. It is located on the county bridge, one-fourth mile above old dam site and Government locks. The conditions at this on and the bench marks are described in Water-Supply Paper 171, page 94, where are given also references to publications that ain data for previous years. The data collected at this point ·aluable for water-power purposes.

Discharge measurements of Des Moines River at Keosauqua, Iowa, in 1906.

ate.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
y 13.....	M. S. Brennan.....	565	1,980	2.45	[a] 2,260
12.....	A. H. Horton.....	587	2,870	3.64	7,860
.....	M. S. Brennan.....	588	4,290	5.93	14,600
.....	..do.....	584	2,710	3.34	6,960

·er frozen entirely across; gage height to bottom of ice is 2.10 feet; ice 0.3 to 1.0 foot thick. The ·ge was about 50 per cent of the open-channel rating for gage height 2.45 feet.

Daily gage height, in feet, of Des Moines River at Keosauqua, Iowa, for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
.....	1.52	3.15	6.50	9.40	3.58	2.20	2.62
.....	1.50	3.18	6.60	9.08	3.50	2.15	2.40
.....	1.80	3.20	5.90	7.65	3.32	2.10	2.18
.....	3.00	2.95	5.35	6.42	3.32	2.05	2.68
.....	3.35	2.55	4.98	5.95	3.95	2.00	2.95
.....	3.60	2.45	4.58	5.85	4.60	2.00	2.02
.....	.....	2.20	4.12	5.62	4.70	2.42	1.70
.....	.....	2.02	3.92	5.50	4.62	2.70	1.52
.....	.....	1.85	4.40	5.75	4.42	2.60	1.42
.....	.....	1.80	4.40	5.85	4.10	2.05	1.30
.....	.....	3.15	4.00	6.52	3.75	1.88	1.28
.....	.....	4.55	3.60	6.55	3.50	1.72	1.20
.....	2.55	2.00	3.20	6.05	3.12	1.68	1.20
.....	.....	3.45	3.05	6.22	2.95	1.60	1.25
.....	.....	2.95	2.32	7.10	2.78	1.55	1.20
.....	.....	3.40	2.02	7.82	2.68	1.48	1.10
.....	.....	5.30	2.02	7.18	2.52	1.42	1.15
.....	.....	5.60	2.08	7.75	2.80	1.40	1.18
.....	.....	1.75	2.05	6.62	3.42	1.40	1.15
.....	6.15	2.48	1.98	6.35	3.50	2.65	1.15
.....	7.90	6.00	1.98	5.80	3.35	2.40	1.12
.....	5.90	5.62	2.00	5.22	3.02	2.18	.....
.....	3.95	7.30	2.20	4.88	2.75	2.00	.....
.....	3.20	8.75	2.48	4.48	2.60	2.02	.....
.....	3.10	10.65	2.55	4.22	2.45	1.92	.....
.....	2.90	7.75	5.55	3.95	2.32	1.90	.....
.....	2.48	6.02	8.70	3.68	2.25	1.88	.....
.....	2.18	6.28	9.28	3.52	2.28	1.82	.....
.....	2.08	.....	9.40	3.55	2.30	1.72	.....
.....	2.30	.....	9.88	3.52	2.30	2.18	.....
.....	2.72	.....	9.80	.....	2.25	.....	.....

:.—Ice conditions January 4 to 20, February 11 to 18. Ice gorged February 15 to 18.

Rating table for Des Moines River at Keosauqua, Iowa, for 1905 and 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.10	1,350	2.40	4,285	3.70	7,740	6.00	14,550
1.20	1,550	2.50	4,540	3.80	8,010	6.20	15,210
1.30	1,755	2.60	4,795	3.90	8,280	6.40	15,870
1.40	1,965	2.70	5,055	4.00	8,550	6.60	16,530
1.50	2,180	2.80	5,320	4.20	9,090	6.80	17,210
1.60	2,395	2.90	5,585	4.40	9,650	7.00	17,890
1.70	2,615	3.00	5,850	4.60	10,220	8.00	21,290
1.80	2,840	3.10	6,120	4.80	10,800	9.00	24,790
1.90	3,070	3.20	6,390	5.00	11,400	10.00	28,390
2.00	3,305	3.30	6,660	5.20	12,000	11.00	32,090
2.10	3,545	3.40	6,930	5.40	12,620		
2.20	3,790	3.50	7,200	5.60	13,250		
2.30	4,035	3.60	7,470	5.80	13,890		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903-1906. It is fairly well defined between gage heights 1.1 feet and 6.4 feet. The table has been extended beyond these limits, being based on one measurement at 15.7 feet.

Monthly discharge of Des Moines River at Keosauqua, Iowa, for 1906.

[Drainage area, 14,300 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	21,000	2,180	[a] 4,160	0.291	0.34
February	30,800	2,700	[b] 8,130	.569	.59
March	28,000	3,260	10,700	.748	.86
April	26,200	7,250	14,600	1.02	1.14
May	10,500	3,910	6,400	.448	.52
June	5,060	1,960	3,260	.228	.25
July (1-21)	5,720	1,350	2,480	.173	.14

[a] Discharge estimated January 4 to 20. [b] Discharge estimated February 11 to 18.

NOTE.—Values are rated as follows: January and February, fair; March to May, excellent; June and July, good.

ILLINOIS RIVER DRAINAGE BASIN.

DESCRIPTION OF BASIN.

Illinois River, the most extensive of all the tributaries of the upper Mississippi, enters the main stream from the east about 24 miles above the mouth of the Missouri. Its drainage area of 29,000 square miles is distributed among three States—Illinois, Wisconsin, and Indiana; 24,700 square miles are in Illinois, extending in a broad band 250 miles long and averaging 100 miles in width directly across the center of the State in a northeast-southwest direction; 1,080 square miles are in Wisconsin, extending north from the Illinois area; and 3,210 square miles are in Indiana, projecting east from the same area.

The eastern projection is the basin of Kankakee River, while the northern one consists of the basins of Fox and Des Plaines rivers. The union of the drainages of these projections may be considered the origin of the Illinois. The name Illinois is applied to the river from the junction of the Kankakee and Des Plaines.

The region drained by the Illinois is level and undulating and includes some of the finest land in the United States. Many large and pros-

perous cities are situated within it, and it is covered with a network of railroads.

The drainage into the Illinois is quite evenly distributed along its course. The more important tributaries are Fox and Spoon rivers from the west, and the Kankakee, Vermilion, and Sangamon from the east.

ILLINOIS RIVER NEAR PEORIA, ILL.

This station was established March 10, 1903, and was discontinued July 21, 1906. It is located on the Peoria and Pekin Union Railroad bridge over the Illinois River, 1½ miles southwest of Peoria. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 97, where are given also references to publications that contain data for previous years. The data collected at this station are valuable for the purpose of studying the effect of the Chicago drainage canal on the river.

Discharge measurements of Illinois River near Peoria, Ill., in 1906.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
January 15	M. S. Brennan	910	8,030	9.35	[a] 9,250
March 10	do	953	13,900	15.60	27,100
April 6	do	949	13,300	14.94	24,200
May 22	A. H. Horton	914	8,530	9.85	10,300

[a] No ice conditions.

Daily gage height, in feet, of Illinois River near Peoria, Ill., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
1	8.75	14.00	15.17	15.33	12.62	9.33	7.83
2	8.75	14.08	15.25	15.33	12.46	9.29	7.75
3	8.75	14.00	15.25	15.29	12.29	9.21	7.75
4	8.83	13.83	15.38	15.17	12.25	8.88	7.67
5	8.96	13.67	15.50	15.08	12.17	8.83	7.54
6	9.12	13.42	15.58	14.96	12.04	8.79	7.38
7	9.42	13.33	15.67	14.75	11.79	8.67	7.25
8	9.33	13.25	15.67	14.75	11.75	8.79	7.33
9	9.38	13.17	15.67	14.79	11.50	8.79	7.12
10	9.50	13.04	15.67	14.83	11.38	8.88	7.00
11	9.50	12.83	15.67	14.96	11.12	8.92	6.96
12	9.50	12.75	15.58	15.08	10.96	8.83	6.92
13	9.50	12.67	15.50	15.08	10.92	8.83	6.92
14	9.50	12.67	15.42	15.17	10.83	8.83	6.83
15	9.58	12.67	15.17	15.25	10.67	8.75	6.83
16	9.79	12.67	14.83	15.29	10.46	8.75	6.83
17	9.83	12.67	14.62	15.12	10.71	8.75	6.75
18	9.83	12.58	14.46	14.96	10.50	8.67	6.67
19	9.75	12.50	14.29	14.83	10.42	8.58	6.67
20	9.67	12.50	14.08	14.71	10.21	8.58	6.67
21	10.04	12.96	13.88	14.58	10.00	8.50	6.75
22	10.42	13.17	13.75	14.46	9.88	8.50	.....
23	10.50	13.50	13.67	14.17	9.75	8.50	.....
24	11.17	13.92	13.54	13.83	9.71	8.50	.....
25	11.79	14.25	13.46	13.67	9.54	8.38	.....
26	12.38	14.71	13.42	13.62	9.58	8.33	.....
27	12.83	15.12	13.79	13.38	9.62	8.21	.....
28	13.21	15.17	14.25	13.17	9.67	7.96	.....
29	13.38	.....	14.71	13.00	9.54	7.83	.....
30	13.62	.....	15.17	12.88	9.38	7.92	.....
31	13.79	.....	15.33	.....	9.29	.....	.....

NOTE.—*Running ice during greater portion of January, February, and March.*

Rating table for Illinois River near Peoria, Ill., for 1906.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
6.60	6,100	8.10	7,660	9.60	9,710	12.20	15,210
6.70	6,200	8.20	7,780	9.70	9,870	12.40	15,730
6.80	6,300	8.30	7,900	9.80	10,040	12.60	16,270
6.90	6,400	8.40	8,020	9.90	10,210	12.80	16,820
7.00	6,500	8.50	8,140	10.00	10,390	13.00	17,400
7.10	6,600	8.60	8,260	10.20	10,760	13.20	17,990
7.20	6,700	8.70	8,390	10.40	11,140	13.40	18,590
7.30	6,800	8.80	8,520	10.60	11,540	13.60	19,210
7.40	6,900	8.90	8,650	10.80	11,960	13.80	19,840
7.50	7,000	9.00	8,790	11.00	12,390	14.00	20,480
7.60	7,110	9.10	8,930	11.20	12,830	15.00	24,090
7.70	7,220	9.20	9,080	11.40	13,280	16.00	28,600
7.80	7,330	9.30	9,230	11.60	13,740		
7.90	7,440	9.40	9,390	11.80	14,220		
8.00	7,550	9.50	9,550	12.00	14,700		

NOTE.—The above table is applicable only for open-channel conditions. It is based on discharge measurements made during 1903–1906. It is well defined between gage heights 8.3 feet and 16 feet. Below gage height 8 feet the table is approximate.

Monthly discharge of Illinois River near Peoria, Ill., for 1906.

[Drainage area, 13,200 square miles.]

Month.	Discharge in second-feet.			Run-off.	
	Maximum.	Minimum.	Mean.	Sec.-ft. per sq. mile.	Depth in inches.
January	19,800	8,460	11,500	0.871	1.00
February	24,800	16,000	18,700	1.42	1.48
March	27,000	18,700	23,600	1.79	2.06
April	25,500	17,100	22,700	1.72	1.92
May	16,300	9,220	12,000	.909	1.05
June	9,280	7,360	8,350	.633	.71
July (1-21)	7,360	6,170	6,620	.502	.39

NOTE.—Values for 1906 are excellent, except those for July, which are good. Discharge during January to March probably only slightly reduced by floating ice.

DESPLAINES RIVER NEAR CHANNAHON, ILL.

This station was established October 23, 1902, and discontinued July 24, 1906. It is located just above the mouth of Jackson Creek, 2½ miles southwest and 2 miles east of Channahon, Ill. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 100, where are given also references to publications that contain data for previous years. The data collected at this station are valuable for the purpose of studying the effect of the Chicago drainage canal on the river.

gage height, in feet, of Desplaines River near Channahon, Ill., for 1906.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
	83.42	82.18	81.95	.....	83.15	83.25	84.20
	83.40	82.65	81.95	.....	82.95	83.22	84.25
	83.42	82.58	81.28	82.90	82.90	83.15	84.18
	83.30	82.68	81.44	82.90	82.82	83.16	84.22
	83.50	82.44	81.36	82.90	82.90	83.15	84.12
	83.30	82.52	81.75	82.92	82.95	83.15	84.18
	83.05	82.55	82.05	82.95	82.98	83.12	84.28
	83.00	82.61	82.25	82.60	82.00	83.22	84.08
	83.18	82.68	82.32	82.22	83.15	83.26	84.10
	82.82	82.82	82.42	81.82	83.16	83.28	84.05
	82.80	83.00	82.45	81.84	83.08	83.25	83.95
	82.78	82.82	82.50	81.90	83.24	83.20	83.92
	82.68	82.86	82.75	82.15	83.25	83.26	83.82
	82.88	82.45	83.00	82.25	83.10	83.24	84.02
	82.95	83.02	82.50	82.36	83.15	83.22	83.82
	83.05	82.59	83.00	82.42	82.90	83.28	83.88
	82.85	82.56	82.98	82.58	83.05	83.28	84.00
	82.85	82.68	82.98	82.52	83.12	83.24	83.92
	82.72	82.74	82.88	82.62	83.18	83.21	83.90
	82.70	82.78	83.40	82.78	83.15	83.18	83.85
	82.36	80.98	83.35	82.80	83.11	83.25	83.65
	80.60	81.70	83.50	82.93	83.18	83.30	83.20
	80.98	81.45	82.90	83.00	83.24	83.22	83.42
	81.72	80.25	83.20	83.08	82.98	83.22	83.85
	81.92	79.82	83.05	83.05	83.10	83.66	.....
	81.84	80.48	82.80	83.00	83.15	84.20	.....
	81.98	81.20	81.90	82.98	.....	84.25	.....
	82.00	81.60	81.90	83.09	83.10	84.25	.....
	82.00	.....	81.80	83.10	83.30	.....	.....
	81.82	.....	81.85	83.16	83.22	84.20	.....
	81.21	.....	82.30	.....	83.15	.....	.....

estimates have been published for 1905 or 1906, as no discharge measurements were made. own, the 1904 rating table is applicable for these two years, but as the information is very e is a large element of uncertainty.

KANKAKEE RIVER AT DAVIS, IND.

tation was established July 13, 1905, and was discontinued 1906. It is located at the railroad bridge at Davis, 8 miles Hamlet, Ind. The conditions at this station and the bench e described in Water-Supply Paper No. 171, page 101. The lected are valuable in connection with the drainage of Kanvamp.

arge measurements of Kankakee River at Davis, Ind., in 1905 and 1906.

Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
	Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
M. S. Brennan	72	241	4.55	213
do	74	238	4.70	317
E. F. Kriegsman	75	354	5.55	463
do	69	257	5.07	294
do	64	214	4.60	272

Daily gage height, in feet, of Kankakee River at Davis, Ind., for 1906.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1		5.4	4.9	4.8	17		5.1	4.9	4.6
2		5.5	4.8	4.6	18		5.0	4.8	4.5
3		5.5	4.8	4.5	19		5.0	4.7	4.4
4		5.5	4.8	4.6	20		4.9	4.9	4.2
5		5.4	4.8	4.6	21		4.9	5.0	4.1
6		5.3	4.8	4.5	22		4.8	4.9	.....
7		5.4	4.8	4.4	23		4.8	4.8	.....
8		5.4	5.0	4.4	24		4.8	4.8	.....
9		5.5	5.8	4.4	25		4.8	4.7	.....
10		5.4	5.8	4.4	26		4.8	4.7	.....
11		5.3	5.6	4.3	27		5.1	4.7	.....
12		5.2	5.5	4.2	28	5.5	5.2	4.7	.....
13		5.4	5.4	4.2	29	5.5	5.1	4.6	.....
14		5.5	5.3	4.3	30	5.5	5.0	4.6	.....
15		5.4	5.1	4.3	31		5.0	.....	.....
16		5.3	5.0	4.4					

Daily discharge, in second-feet, of Kankakee River at Davis, Ind.

JULY TO DECEMBER, 1905.[a]

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		280	260	295	340	595	17	725	240	520	295	385	.....
2		280	690	295	360	570	18	500	225	520	340	385	.....
3		280	960	295	360	515	19	395	225	470	360	385	.....
4		260	1,110	295	340	.....	20	350	260	440	385	385	.....
5		225	1,140	295	360	.....	21	305	240	415	385	385	.....
6		420	1,110	295	360	.....	22	280	280	390	385	385	.....
7		350	960	295	510	.....	23	260	225	365	385	360	.....
8		280	750	295	510	.....	24	240	225	340	360	360	.....
9		225	605	295	485	.....	25	240	280	340	360	385	.....
10		225	575	315	460	.....	26	240	305	320	340	385	.....
11		225	520	315	435	.....	27	240	305	300	340	385	.....
12		225	495	315	410	.....	28	260	280	315	340	410	.....
13		260	470	295	410	.....	29	470	280	315	340	435	.....
14	1,000	225	445	275	385	.....	30	420	260	295	315	625	.....
15	1,030	225	395	275	385	.....	31	350	240	.....	295	.....	.....
16	940	260	420	275	385	.....							

APRIL TO JULY, 1906.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1		425	270	315	17		330	280	270
2		450	250	270	18		305	260	250
3		450	.....	250	19		305	240	235
4		450	.....	270	20		285	295	200
5		425	.....	270	21		285	315	180
6		385	.....	250	22		260	295	.....
7		410	250	235	23		.....	275	.....
8		410	280	235	24		.....	295	.....
9		435	470	235	25		.....	275	.....
10		410	470	235	26		260	275	.....
11		385	420	215	27		330	275	.....
12		360	390	200	28	450	335	290	.....
13		410	370	200	29	450	315	270	.....
14		435	345	215	30	450	295	270	.....
15		410	300	215	31		295	.....	.....
16		385	300	235					

[a] Gage heights for 1905 were published in Water-Supply Paper No. 171.

NOTE.—On account of the shifting character of the river the discharge has been obtained indirectly from the discharge measurements. (See introduction to Water-Supply Paper No. 211.)

Monthly discharge of Kankakee River at Davis, Ind., for 1905–6.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
1905.			
31)	1,030	240	458
	420	225	262
r	1,140	260	542
	385	275	321
r	625	340	405
1906.			
	450	260	355
	470	240	301
1)	315	180	237

–Values for 1905 and 1906 are approximate, owing to changing conditions of flow at the gaging

KANKAKEE RIVER AT MOMENCE, ILL.

s station was established February 22, 1905, and was discon- July 20, 1906. It is located on the highway bridge in Momence, bout one-half mile below the Chicago and Eastern Illinois Rail- bridge. The conditions at this station and the bench marks scribed in Water-Supply Paper No. 171, page 102. The data ed at this station are valuable in connection with the drainage nkakee Swamp.

Discharge measurements of Kankakee River at Momence, Ill., in 1906.

e.	Hydrographer.	Width.	Area of section.	Gage height.	Dis- charge.
		Feet.	*Sq. ft.*	*Feet.*	*Sec.-ft.*
	M. S. Brennan	501	1,190	3.27	3,920
	E. F. Kriegsman	473	851	2.75	2,350
	do	466	822	2.68	2,230
	do	440	592	2.12	1,200

Daily gage height, in feet, of Kankakee River at Momence, Ill., for 1906.

Feb.	Mar.	Apr.	May.	June.	July.	Day.	Feb.	Mar.	Apr.	May.	June.	July.
	2.70	2.95	2.52	2.00	1.80	17		3.05	2.95	2.10	2.00	1.65
	2.70	2.90	2.50	2.00	1.80	18		3.02	2.90	2.10	2.00	1.65
	3.30	2.90	2.45	2.00	1.80	19		2.95	2.90	2.10	2.05	1.65
	3.42	2.90	2.42	2.00	1.80	20		2.92	2.82	2.05	2.10	1.65
	3.35	2.90	2.38	2.00	1.80	21	2.68	2.85	2.80	2.02	2.08	
	3.25	3.00	2.35	1.95	1.78	22	2.70	2.82	2.80	2.00	2.08	
	3.20	3.02	2.30	1.98	1.73	23	2.75	2.78	2.75	2.00	2.05	
	3.35	3.05	2.25	2.08	1.70	24	2.85	2.75	2.75	1.98	2.00	
	3.30	3.42	2.25	2.20	1.70	25	3.10	2.78	2.70	1.95	1.95	
	3.30	3.50	2.20	2.20	1.70	26	3.02	2.92	2.70	1.95	1.90	
	3.20	3.38	2.20	2.20	1.70	27	2.88	3.20	2.65	1.95	1.90	
	3.12	3.22	2.20	2.18	1.70	28	2.78	3.25	2.65	2.00	90	
	3.05	3.10	2.20	2.10	1.65	29		3.12	2.60	2.00	88	
	3.02	3.08	2.18	2.08	1.65	30		3.00	2.58	2.00	1.85	
	3.02	3.02	2.12	2.05	1.65	31		3.00		2.00		
	3.02	3.00	2.10	2.05	1.68							

Rating table for Kankakee River at Momence, Ill., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.60	310	2.10	980	2.60	2,030	3.10	3,210
1.70	410	2.20	1,170	2.70	2,260	3.20	3,460
1.80	520	2.30	1,380	2.80	2,490	3.30	3,710
1.90	650	2.40	1,590	2.90	2,730	3.40	3,970
2.00	810	2.50	1,810	3.00	2,970	3.50	4,230

NOTE.—The above table is applicable only for open-channel conditions. It is based on 9 discha measurements made during 1905 and 1906. It is well defined between gage heights 2.1 feet and 4 f Below gage height 2.1 feet the table is uncertain, as the two lowest measurements are inconsistent.

Monthly discharge of Kankakee River at Momence, Ill., for 1906.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
February (21–28)	3,020	2,210	2,600
March	4,020	2,260	3,110
April	4,230	1,990	2,810
May	1,850	730	1,110
June	1,170	585	861
July (1–20)	520	360	425

NOTE.—Values for 1906 are excellent, except those for July, which are good.

YELLOW RIVER AT KNOX, IND.

This station was established August 21, 1905, and discontinued July 23, 1906. It is located on the North Heaton Street Highway Bridge, 100 rods north of the New York, Chicago, and St. Louis Railroad. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 104. The data are valuable in connection with the drainage of Kankakee Swamp.

Discharge measurements of Yellow River at Knox, Ind., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
August 21	M. S. Brennan	91	98	2.02	142
October 3	do	94	96	2.03	151
1906.					
March 11	E. F. Kriegsman	120	294	4.65	664
April 28	do	84	158	3.06	294
June 11	do	117	269	4.07	491
June 12	do	117	241	3.68	438
June 12	do	116	198	3.46	381
June 28	do	92	120	2.59	249

Daily gage height, in feet, of Yellow River at Knox, Ind., for 1906.

Day.	Mar.	Apr.	May.	June.	July.	Day.	Mar.	Apr.	May.	June.	July
1	3.4	5.1	2.7	2.6	2.5	17	3.3	5.7	2.4	2.6	2.0
2	3.7	5.0	2.8	2.6	2.4	18	3.2	5.0	2.35	2.5	2.0
3	4.0	4.0	2.85	2.5	2.35	19	3.2	4.7	2.3	2.35	2.1
4	5.9	3.8	2.9	2.4	2.35	20	3.15	3.9	2.3	2.4	2.0
5	6.4	3.5	2.8	2.2	2.2	21	3.1	3.7	2.3	2.5	1.9
6	6.95	3.8	2.85	2.3	2.1	22	3.0	3.5	2.25	2.5	2.0
7	6.65	4.1	2.7	2.5	2.0	23	3.0	3.3	2.2	2.5	2.0
8	5.7	4.2	2.6	2.6	1.9	24	2.9	3.15	2.2	2.4	.....
9	5.2	4.3	2.55	3.5	1.9	25	3.0	3.0	2.2	2.3	.....
10	5.15	4.5	2.5	4.3	2.0	26	3.3	3.0	2.4	2.25	.....
11	4.65	4.9	2.5	4.5	2.1	27	4.3	3.1	2.5	2.2	.....
12	4.4	4.7	2.45	3.7	2.15	28	6.4	3.05	2.6	2.7	.....
13	4.0	4.5	2.45	3.1	2.1	29	6.1	2.9	2.7	2.6	.....
14	3.8	4.7	2.4	2.8	2.0	30	6.0	2.8	2.75	2.5	.....
15	3.5	4.8	2.4	2.7	2.0	31	5.4	.....	2.7	.....	.....
16	3.4	5.4	2.4	2.7	2.0						

Rating table for Yellow River at Knox, Ind., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.00	56	2.20	171	3.40	368	5.20	792
1.10	63	2.30	185	3.50	387	5.40	848
1.20	70	2.40	199	3.60	407	5.60	906
1.30	78	2.50	214	3.70	428	5.80	966
1.40	86	2.60	230	3.80	449	6.00	1,028
1.50	94	2.70	246	3.90	471	6.20	1,091
1.60	103	2.80	262	4.00	493	6.40	1,155
1.70	113	2.90	278	4.20	539	6.50	1,187
1.80	123	3.00	294	4.40	586	6.60	1,219
1.90	133	3.10	312	4.60	634	6.80	1,284
2.00	145	3.20	330	4.80	685	7.00	1,350
2.10	158	3.30	349	5.00	738		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 8 discharge measurements made during 1905–6. It is well defined between gage heights 2 feet and 5 feet. Beyond these limits the table is approximate.

Monthly discharge of Yellow River at Knox, Ind., for 1905–6.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
1905. [a]			
August (21–31)	133	56	77.7
September	294	133	215
October	230	86	144
November	294	145	199
December (1–16)	387	214	320
1906.			
March	1,330	278	628
April	936	262	524
May	278	171	218
June	610	171	254
July (1–23)	214	133	157

[a] For 1905 gage heights see Water-Supply Paper No. 171.

NOTE.—Values are rated as follows: August, 1905, fair; October, 1905, good; remainder of the above period, excellent.

FOX RIVER AT SHERIDAN, ILL.

This station was established in September, 1905, and was discontinued July 20, 1906. It is located at the Glen Park highway bridge at Sheridan, Ill. The conditions at this station and the bench marks are described in Water-Supply Paper No. 171, page 105. The data collected are valuable for water-power purposes.

Discharge measurements of Fox River at Sheridan, Ill., in 1905–6.

Date.	Hydrographer.	Width.	Area of section.	Gage height.	Discharge.
1905.		*Feet.*	*Sq. ft.*	*Feet.*	*Sec.-ft.*
September 19	Hanna and Brennan	199	1,020	4.05	1,100
October 31	M. S. Brennan	199	1,000	4.12	1,080
1906.					
March 11	M. S. Brennan	196	1,340	5.70	3,330
March 29	A. H. Horton	204	1,340	5.70	3,320
March 30	do	204	1,320	5.60	3,180
May 21	do	199	916	3.58	596
May 21	do	199	916	3.58	595
June 20	M. S. Brennan	198	814	3.20	387

Daily gage height, in feet, of Fox River at Sheridan, Ill., for 1906.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Day.	Feb.	Mar.	Apr.	May.	June.	July.
1		6.3	5.5	4.25	3.75	3.65	17		5.1	5.35	3.85	3.25	2.95
2		6.65	5.4	4.6	3.6	3.3	18		5.2	5.3	3.85	3.0	3.0
3		8.2	5.3	4.65	3.45	3.4	19		5.1	5.2	3.8	3.2	3.05
4		7.35	5.25	4.35	3.3	3.4	20		4.95	5.1	3.75	3.25	3.05
5		6.7	5.1	4.25	3.5	3.1	21		4.85	5.0	3.65	3.15	
6		6.7	5.3	4.15	3.55	3.15	22	6.8	4.5	4.85	3.85	3.05	
7		6.5	5.2	4.0	3.45	3.2	23	6.15	4.45	4.75	3.8	3.1	
8		6.45	5.15	4.2	3.35	3.05	24	6.7	4.25	4.75	4.0	3.05	
9		6.35	5.9	4.15	3.3	3.0	25	9.05	4.70	4.6	4.15	3.0	
10		6.25	6.35	4.1	3.4	3.25	26	7.6	4.85	4.55	4.0	3.0	
11		6.1	6.0	4.05	3.15	3.05	27	6.5	7.40	4.45	3.9	3.0	
12		5.8	5.75	4.0	3.2	3.0	28	6.5	6.9	4.4	3.8	3.25	
13		5.35	5.65	3.95	3.35	3.15	29		5.9	4.3	4.0	3.1	
14		5.1	5.5	3.75	3.4	3.05	30		5.6	4.2	3.95	3.65	
15		5.1	5.5	3.95	3.35	3.0	31		5.65		3.70		
16		4.9	5.45	3.85	3.4	2.95							

Rating table for Fox River at Sheridan, Ill., for 1905–6.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
2.90	220	4.10	1,100	5.30	2,710	7.00	5,630
3.00	260	4.20	1,210	5.40	2,860	7.20	6,010
3.10	310	4.30	1,330	5.50	3,020	7.40	6,400
3.20	360	4.40	1,450	5.60	3,180	7.60	6,800
3.30	420	4.50	1,570	5.70	3,340	7.80	7,200
3.40	480	4.60	1,700	5.80	3,500	8.00	7,600
3.50	550	4.70	1,830	5.90	3,660	8.20	8,020
3.60	630	4.80	1,970	6.00	3,830	8.40	8,440
3.70	710	4.90	2,110	6.20	4,170	8.60	8,860
3.80	800	5.00	2,260	6.40	4,520	8.80	9,280
3.90	900	5.10	2,410	6.60	4,880	9.00	9,700
4.00	1,000	5.20	2,560	6.80	5,250		

NOTE.—The above table is applicable only for open-channel conditions. It is based on 8 discharge measurements made during 1905–6. It is well defined between gage heights 3.2 feet and 5.7 feet.

Monthly discharge of Fox River at Sheridan, Ill., for 1905–6.

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
1905.[a]			
September (20–30)	1,050	710	831
October	1,510	420	863
November	1,210	515	912
1906.			
February (22–28)	9,780	4,080	5,770
March	8,020	1,270	3,570
April	4,430	1,210	2,540
May	1,760	670	1,020
June	755	260	422
July (1–20)	670	240	336

[a] For 1905 gage heights, see Water-Supply Paper No. 171.

NOTE. Values are rated as follows: 1905 and March to May, 1906, excellent; February, June, and July, 1906, good.

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